



# **SEATTLE ARTCC AUTOMATION WING REHABILITATION SECOND FLOOR AND ATTIC**

## **SPECIFICATIONS**

### **Volume I**

**01000 - 13850**

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Prepared by: Federal Aviation Administration  
ATO Tech Ops Engineering Services  
Seattle Enroute Unit

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**DIVISION 1**

**GENERAL CONDITIONS**

**SECTION 01000**

**SUMMARY OF WORK**

**PART 1 – GENERAL**

**1.1 SCOPE OF WORK**

These specifications, together with the referenced specifications, standards, and drawings specified in the Contract Documents, cover the requirements for all work associated with the renovation in the Automation Wing 2<sup>nd</sup> floor and attic space of the Automation Wing at the Seattle Air Route Traffic Control Center (ARTCC) located at 3101 Auburn Way, South, Auburn, Washington. Following is a general description of the work:

This project renovates the Automation Wing 2<sup>nd</sup> floor and attic space. The Work includes:

- A. Structural seismic upgrades for the Automation Wing and attic.
- B. The construction of new office spaces, classrooms, and restrooms.
- C. The installation of mechanical systems (ductwork and exhaust fans) Install VAV terminal units, humidifiers, fin tube radiators, exhaust fans, plumbing fixtures and associated piping, and pre-action fire sprinkler systems.
- D. The installation of electrical systems (lighting, power, public address system, LAN, telephone, and fire detection).

All work must be coordinated in order to maintain an operational facility. The total contract duration for completion of all work shall be 273 calendar days, excluding the following FAA holiday moratorium. The Contractor shall be responsible for repairing all damage incurred during demolition/construction. The area of work shall remain clean and clear of all hazards.

FAA Holiday Moratorium: No work shall be scheduled or take place during the week of and the weekend preceding and following: the Thanksgiving, Christmas and New Years Holidays. Only emergency work to restore critical services to the facility will be considered and a moratorium waiver must be submitted and approved. The moratorium period will not be counted against the contract construction duration for the project.

**1.2 INTENT OF SPECIFICATIONS**

- A. This specification identifies all labor and equipment to perform the work required to construct the facility. All work performed and all materials and equipment used shall be approved by the Contracting Officer (CO) and/or the Resident Engineer (RE). This shall include but not be limited to inspection, scheduling, reporting, and submittals.
- B. Title - Titles to division and sections of the specifications and notes and titles on drawings referring to subcontractors, division of work by trade, or type of work, are introduced merely for convenience in reading the specifications and drawings and do not imply any separate contractual arrangements of work assignments. Such separations into

titled divisions and sections shall not operate to make the Government an arbiter to establish subcontract limits between the contractor and subcontractors, or between the subcontractors themselves.

**1.3 CONTRACT REQUIREMENTS**

Work is to be performed by a critical area of air traffic control within a critical air traffic control center. Contractor is required to have had 5 years experience working in “data centers” or other similar critical facilities. Due to the location of this work the contractor is required to employ measures to reduce noise transmission through the walls and ceilings. Submit noise reduction plan for approval.

**1.4 CONTRACT DOCUMENTS**

- A. The construction of this facility shall be in accordance with the lines and grades shown on the drawings. The contractor shall not use dimensions scaled from drawings. All dimensions shown on the drawings shall be verified by the contractor by actual measurements in the field. Any discrepancies between the drawings and specifications and the existing conditions shall be referred to the CO for adjustment before any work affected is performed.

**1.5 PRECEDENCE OF CONTRACT DOCUMENTS**

- A. In the event of a difference between the following contract provisions, the order of precedence to determine which provision shall govern is:
  - 1. Contract Clauses and Provisions
  - 2. Project Specifications
  - 3. Project Drawings
- B. Any discrepancies between the contract provisions, the specifications and the contract drawings shall be referred to the CO for a written determination in accordance with Contract Clause entitled Order of Precedence.

**1.6 CONTRACTING OFFICER**

- A. The term "Contracting Officer" (CO) as used herein denotes the person designated to act on behalf of the Government in the performance of this contract. Where reference is made to "Federal Aviation Administration" (FAA), "Resident Engineer" (RE), "Contracting Officer's Representative" (COR), or the like, this shall mean the Contracting Officer or his/her authorized representative.

**1.7 CONTRACTOR SUPERINTENDENCE**

- A. In accordance with Contract Clause entitled SUPERINTENDENCE BY THE CONTRACTOR, the Contractor shall at all times during performance of this contract and until the work is completed and accepted, directly superintend the work or assign and have on site a competent superintendent with the authority to act for the Contractor.

**PART 2 – MATERIAL**

**NOT USED**

**PART 3 – EXECUTION**

**NOT USED**

**PART 4 – QUALITY ASSURANCE**

**4.1 AS-BUILT DRAWINGS**

The Contractor shall maintain at the job site two sets of full-size contract drawings marked to show any deviations which have been made from the contract drawings, including buried and concealed construction and utility features revealed during the course of construction. These drawings shall be available for review by the Contracting Officer at all times. Upon completion of the work, deliver the marked sets of prints to the Contracting Officer. Requests for partial payments will not be approved if the marked prints are not current, and request for final payment will not be approved until the marked prints are delivered to the Contracting Officer.

**\* \* \* END OF SECTION \* \* \***

## Contractor/Subcontractor List

[illegible]

**SECTION 01020**

**SITE ACCESS, CONSTRUCTION LIMITS, USE OF FACILITIES AND WORK HOURS**

**PART 1 – GENERAL**

**1.1 EXISTING FACILITY OPERATIONS**

The ARTCC is a 24 hour, 7 day per week operating facility. This facility is a critical operational center for air traffic control. The Contractor shall perform all work in a manner which does not conflict with or adversely affect the air traffic operational environment or functions of the ARTCC. In the event of any actual or potential conflict, air traffic control activities shall have priority over all Contractor activities. The Contractor shall plan for and provide services in such a manner and at such times that will not disrupt facility operations, and shall conform to those procedures considered essential by the FAA for ensuring air traffic safety.

**1.2 CONSTRUCTION LIMITS AND ACCESS**

Access for the Contractor, sub-contractors, employees, deliveries, etc., will be designated by the RE. **NO CONTRACTOR OR CONTRACTOR DELIVERIES WILL BE ALLOWED TO OCCUR IN THE ABSENCE OF THE RE OR THE RE'S DESIGNATED REPRESENTATIVE ON SITE.** The Contractor's presence on site and all Contractor deliveries must be pre-arranged with the RE. No deliveries arriving outside of normal working hours and/or the presence of the Contractor on site will be allowed unless as pre-arranged through the RE. The following requirements **MUST** be followed in order to obtain access to the facility site:

- A. All persons entering or delivering to this federal facility must have valid government issued identification.
  - 1. Valid issued government identification is:
    - a) ID issued by the federal, state, county, or city government or by the military.
    - b) Must have the persons legal name.
    - c) Must have a unique ID number.
    - d) Must have an expiration date.
    - e) Must have a picture of the individual.
    - f) Must have the name of the agency issuing it.  
(examples: state issued drivers license or IDs, passports, or military ID.)
- B. **CONTRACTORS MUST HAVE SUBMITTED, TO THE FAA, WORKERS OR OTHER COMPANY EMPLOYEES NAMES AND INFORMATION WHO THEY ARE REQUESTING ACCESS TO THE FACILITY AT LEAST 24 HOURS PRIOR TO ENTRY**
- C. Persons entering on to federal property are prohibited from having on their person or in their vehicle to include all visitor lots:
  - 1. Weapons of any kind to include but not limited to:
    - a) Guns

- b) Knives with blades over 3 inches except for valid tools.
  - c) Projection devices, bow & arrows, paint ball weapons, blow guns ect.....
  - d) Clubs, batons, collapsible batons, or saps.
  - e) Stun guns or tazers.
  - f) Chemical agents, mace, or pepper sprays.
  - g) Marshal arts weapons of any kind.
- 2. Open alcohol containers. (any container without an intact factory seal.)
- 3. Illegal drugs.
- 4. All animals with the exception of a verified service animal is prohibited on the facility and will never be left in a vehicle on the facility.
- 5. All persons, vehicles, and property is subject to search at all times.
- 6. Family members, friends, children or minors not listed on the work contract will not be granted access.
- D. The Contractor shall confine operations, activities, storage of materials and employee parking within the area, as designated by the RE. Additional space the Contractor deems necessary shall be obtained off site, at no additional cost to the Government.
- E. Access to the construction site shall be kept unobstructed. If temporary access obstruction is unavoidable, the Contractor shall advise the RE immediately.
- F. Temporary roadways and/or other access may be authorized only by the facility, via the RE.
- G. Vehicles transporting materials shall not be loaded beyond the capacity prescribed by Federal, State or Local law.
- H. Vehicles delivering materials shall not have any other project material loaded into/onto the vehicle except for the materials that will be left at the ARTCC job site.
- I. No deliveries will be accepted or permitted on site from anyone who does not meet the required Government issued identification requirements listed in this specification section.
- J. Obstruction of existing roadways, driveways, etc., to the ARTCC is strictly prohibited. Access to the loading dock and ramp shall be maintained.
- K. Damage caused by the Contractor's activities to existing paving, lawns, curbs, sidewalks, interior/exterior of the building shall be repaired. All costs of repairs shall be paid by the Contractor. After notice to proceed and prior to the commencement of construction, the Contractor and RE shall conduct joint inspections of the existing areas affected by the construction. Existing damage/defects shall be noted and will be used as the basis for determination of damages caused by the Contractor's operations.

### **1.3 CONTRACTOR'S USE OF PREMISES**

- A. Contractor shall assume full responsibility for the protection and safekeeping of products stored on the site.



- B. The Contractor and his subcontractors shall maintain the job site in a neat and orderly condition.
- C. Concessionaires shall not be allowed on the grounds of the facility.
- D. Use of the cafeteria is permitted except between the hours of 11:30 a.m. to 1:00 p.m. and only if the Contractor personnel are in clean clothes and shoes (as determined by the RE).

**1.4 GOVERNMENT USE AND ACCESS TO PREMISES**

- A. The Government reserves the right to enter the premises during the term of the contract for periodic work inspections and for maintenance of existing equipment. The Contractor shall allow the CO and RE complete access to all portions of the work.
- B. See Part II, Section I, Contract Clause entitled OTHER CONTRACTS, for work by other Contractors.

**1.5 WORK HOURS**

- A. Work shall be performed during normal working hours (7:00 a.m. to 3:30 p.m.) except for the following:
  - 1. Work affecting the occupied control room (11:00 PM – 6:00 AM)
- B. The Contractor may elect to work two shifts or may elect to work outside the normal working hours, early morning or late afternoons, due to weather conditions, provided that this is scheduled, coordinated, and agreed to by the RE, the facility and CO, a minimum of 5 working days in advance. No claims for increased overhead or equitable adjustment will be entertained if the Contractor elects to work more than one shift.
- C. Shutdowns and cutovers of environmental, utility and electrical systems impacting the facility operations shall be accomplished between the hours of 10 p.m. and 6 a.m. All preparatory work shall be completed prior to shutdown/cutover to minimize downtime. Shutdown and cutovers shall be scheduled and coordinated with the RE a minimum of 10 working days in advance of the shutdown/cutover.
- D. Construction noise within the facility must be minimized between 7:00 a.m. and 8:30 p.m. and shall be scheduled in advance, coordinated with the facility and approved by the RE. Construction activities that affect facility operations (i.e concrete cutting, jack hammering, metal cutting, ect...) will be scheduled outside regular work hours. These hours will need to be approved by the onsite RE.
- E. No work shall be scheduled or take place during the week of and the weekend preceding and following the Thanksgiving, Christmas and New Years Holidays. Only emergency work to restore critical services to the facility will be considered and a moratorium waiver must be submitted and approved. The moratorium period will not be counted against the contract construction duration for the project.

**1.6 NOTIFICATION OF PLANNED OVERTIME WORK**

- A. In the event the Contractor intends to work overtime, nights, weekends or holidays, he shall notify the RE, who will coordinate with the CO for approval, at least 24 hours in advance of his commencement of the overtime work and 48 hours prior to night, weekend or holiday work.

**1.7 SECURITY REQUIREMENTS**

- A. Contractor shall provide the CO prior to Notice-To-Proceed with a complete list of contractor and subcontractor personnel including social security number, date of birth, and city of residence. The list shall be kept current during project work. No Contractor employees, associates, or other representatives shall be permitted access to the ARTCC grounds until that person's name and information has been provided and the appropriate security investigation has been completed by an FAA security officer for approval of access to the site with specified restrictions, if any. The FAA security officer may refuse access to the site to any employee, associate or other representative at any time for any reason.
- B. Contractor and subcontractor personnel may be subject to a security investigation by the FAA. The Contractor shall promptly complete and return applicable security forms furnished with the contract document for each employee as required. Forms must be completed and returned to the CO prior to subject employees working in the facility.
- C. Contractor's personnel shall report to the FAA Security Guard at the front security gate and submit proper identification to obtain a FAA badge which will be worn on an outside garment at all times while on the ARTCC premises. The badge is a "clip-on" type, this badge shall be returned daily to the security guard when such personnel leave the ARTCC premises. This badge MUST be worn at all times.
- D. For projects with long durations (i.e. 6 months or more), the site superintendent must get approval for a NACI badge. This badge requires forms to be filled out and an approval process that will take 30 days or longer. Once approved a blue photo ID badge will be issued and the NACI badged individual will need to escort subcontractors and deliveries. The NACI badged individual shall retain this badge until the end of the project or the badge expiration date (whichever is sooner). At that time the badge MUST be returned to the RE.
- E. Work shall be arranged so that Contractor's personnel can be escorted when required by the FAA, in certain areas which are considered to be restricted. No Contractor employee, associate, or other representative shall have any visual, audible, or physical access to any area marked as a "closed area". Any persons gaining access to any "closed area" shall report the access to the CO who will coordinate with the FAA security office for a de-brief. Contractor's personnel shall not violate any security regulations pertaining to the ARTCC facility. Violators may be removed from the premises with the right to re-enter revocable. Contractor's day-to-day work schedules in the restricted areas shall be so arranged to allow for minimum escort.

- F. Current procedures at FAA facilities include the "right to search". Access to the site constitutes consent to search. If in the judgment of the FAA Security Guard a cause to search a vehicle or the person of personnel exists, such search will be made.

**PART 2 – MATERIAL**

**NOT USED**

**PART 3 – EXECUTION**

**NOT USED**

**PART 4 – QUALITY ASSURANCE**

**4.1 SUBMITTALS**

Submittals required include, but are not necessarily limited to, the following:

- A. Contractor and Subcontractor personnel including social security number, date of birth, and city of residence
- B. Contractor/Subcontractor list (use included form) – Ask RE for electronic version if so desired.
- C. Security Forms (Blank forms to be provided by RE to the Contractor)

**\* \* \* END OF SECTION \* \* \***

## TEST REPORT

STRUCTURE OR BUILDING \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_

DESCRIPTION OF ITEM, SYSTEM, OR PART OF SYSTEM TESTED:

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DESCRIPTION OF TEST:

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NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR CONTRACTOR:

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

SIGNATURE \_\_\_\_\_

I HEREBY CERTIFY THAT THE ABOVE DESCRIBED ITEM, SYSTEM, OR PART OF SYSTEM HAS BEEN TESTED AS INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS REQUIRED IN THE CONTRACT SPECIFICATIONS.

SIGNATURE OF CONTRACTOR QUALITY CONTROL INSPECTOR \_\_\_\_\_

DATE \_\_\_\_\_

REMARKS:

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## DAILY CONSTRUCTION QUALITY CONTROL REPORT

Date: \_\_\_\_\_ Report No. \_\_\_\_\_

Contract No.: \_\_\_\_\_

Description and Location of Work:

\_\_\_\_\_

WEATHER: (Clear) (P. Cloudy); Temperature: \_\_\_\_\_ Min. \_\_\_\_\_ Max;  
(Snow) (Rainfall) \_\_\_\_\_ Inches

Contractor/Subcontractor Activity:

	Work in Progress	Contractor/ Subcontractor	Craft	Time Worked
a.	_____	_____	_____	_____
b.	_____	_____	_____	_____
c.	_____	_____	_____	_____
d.	_____	_____	_____	_____
e.	_____	_____	_____	_____
f.	_____	_____	_____	_____

Equipment Data: (Indicate items of construction equipment, other than hand tools, at the job site and whether or not used.)

	Equipment	Contractor/ Subcontractor	Craft	Time Used
a.	_____	_____	_____	_____
b.	_____	_____	_____	_____
c.	_____	_____	_____	_____
d.	_____	_____	_____	_____

### Three Phase Inspection Program:

1. Preparatory Inspection: Include status of transmittals, Quality Control meetings, tests required, materials delivered, materials compliance with submittals and standards, material storage, conflict in drawings or specifications, environmental conflicts, instructions from Government.

Job Safety: (Analyze hazards. Plan safety program. Schedule safety meetings.)

2. Initial Inspection: Include new feature of work started, number of personnel in trades and hours worked, result of inspection, compliance of work with plans and specifications, results of tests, instructions from Government.

Job Safety: (Insure compliance with Safety Program and Analysis. Observe safety meetings and reporting.)

3. Followup Inspections: Include work inspected, result of inspection, compliance with plans and specifications, results of tests, delays to work, defects, and rejection of work, proposed remedial action, corrective action taken, instructions from Government.

Job Safety: (Note any deficiencies and corrections.)

CONTRACTOR'S VERIFICATION: The above report is complete and correct and all material and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

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CONTRACTOR QUALITY CONTROL INSPECTOR

**SECTION 01030**

**CONTRACTOR QUALITY CONTROL, COORDINATION, PERMITS, TESTING**

**PART 1 – GENERAL**

**1.1 CONTRACTOR QUALITY CONTROL**

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with this specification.

**1.2 QUALITY CONTROL /ASSURANCE**

The Contractor shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality and to comply fully with manufacturers' instructions. The Contractor shall identify a single person to ensure quality control/assurance. The Contractor may select the project's supervisor or any person with a minimum of 5 years experience in the single-ply system. An independent Quality Control/Assurance officer is not necessary.

**1.3 SUBMITTALS**

Submittals required include, but are not necessarily limited to, the following:

- A. The Contractor shall coordinate with the FAA on procedures for processing shop drawings, samples, certificates, and other submittals. The procedures shall include the establishment of responsibilities to assure at each level adequate review and approval; timely delivery, including verification procedures; and proper storage.
- B. Quality control records

**1.4 AS-BUILT DRAWINGS**

The Contractor shall maintain at the job site two sets of full-size contract drawings marked to show any deviations which have been made from the contract drawings, including buried and concealed construction and utility features revealed during the course of construction. These drawings shall be available for review by the RE at all times. Upon completion of the work, deliver the marked sets of prints to the RE. Requests for partial payments will not be approved if the marked prints are not current, and request for final payment will not be approved until the marked prints are delivered to the RE.



PART 2 – MATERIAL

NOT USED

PART 3 – EXECUTION

3.1 QUALITY REVIEWS

Control - Contractor Quality Control is the means by which the Contractor ensures that the construction, that includes the work of subcontractors and suppliers, complies with the requirements of the contract. The controls shall be adequate to cover all construction operations, including both on-site and off-site fabrication. The controls shall include at least three phases of controls for all definable features of work, as follows:

- A. Preparatory Phase - This phase shall be performed prior to beginning work.
  - 1. A review of each paragraph of applicable specifications.
  - 2. A review of the contract plans.
  - 3. A check to assure that all materials and drawings have been submitted and approved.
  - 4. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawing or submitted data, and are properly stored.
  - 5. The Government shall be notified of any of the required action of the preparatory phase. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.
- B. Initial Phase - This phase shall be accomplished at the beginning of work. The following shall be accomplished:
  - 1. A check of preliminary work to ensure that it is in compliance with contract requirements and submittals.
  - 2. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with sample panels is appropriate.
  - 3. Review application of roof system or repair procedure.
  - 4. The Government shall be notified at least 48 hours in advance of beginning the initial phase.
- C. Follow-up Phase - Daily checks with the RE shall be performed to assure continuing compliance with contract requirements. The Contractor shall not build upon or conceal non-conforming work.
- D. Additional Preparatory and Initial Phases - Additional preparatory and initial phases may be conducted as determined by the Government if the quality of on-going work is unacceptable; or if work is resumed after a substantial period of inactivity, or if other problems develop.

**3.2 CONTRACTOR REQUEST FOR INFORMATION (RFI)**

In accordance with Contract Clause "Specifications, Drawings, and Material Submittals", in case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the RE, who shall promptly respond in writing. Submit a written request to RE and allow at least 3 working days for Government response. Include the date of the request, the date response is needed, a description of the problem, identification of work on hold, impact of delay in Government response, scope changes deemed necessary and recommended solutions, and any other information pertinent. The Government reserves the right to charge the Contractor for administrative costs associated with responding to an RFI, which does not involve discrepancies in the specifications and drawings.

**3.3 TESTING PROCEDURE**

The Contractor shall perform tests required to verify that control measures are adequate to provide a product which conforms to contract requirements.

**3.4 COMPLETION INSPECTION**

At the completion of all work or any increment, the Contractor with the RE shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved plans and specifications.

**3.5 DOCUMENTATION**

A. The Contractor shall maintain current records of quality control operations, activities, and tests performed, including the work of subcontractors and suppliers. These records shall include but not be limited to the following:

1. Contractor/subcontractor and their area of responsibility.
2. Work performed today, giving location, description, and by whom.
3. Material received.
4. Identify submittals reviewed, with contract reference, by whom, and action taken.
5. List instructions given/received and conflicts in plans and/or specifications.
6. Contractor's verification statement.
7. These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. One report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. Reports shall be signed and dated by the Contractor.

These records shall be submitted to the FAA RE on a weekly basis.

**3.6 SAMPLE FORMS**

A. Sample Contractor Quality Control Report forms are enclosed at the end of this section. The Contractor shall choose one form or submit another one for approval.

1. Sample of typical Contractor's daily report

### 3.7 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor at the site of the work, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

### 3.8 COORDINATION, LOCAL PERMITS AND TESTING

#### A. Project Coordination

1. It shall be the duty of the Contractor to prepare a detailed schedule of work and work layout to resolve conflicts and to assure coordination of the work by different trades.
2. It shall be the duty of the Contractor to resolve all coordination conflicts that arise among his subcontractors. If, in the opinion of the RE, a potential or actual conflict exists, the RE will notify the CO, who shall instruct the Contractor to take immediate steps to coordinate the work and resolve any conflicts.

- B. Two Week Look-Ahead Schedule - Contractor shall provide a two week look-ahead schedule to the Resident Engineer. The schedule shall provide specific location where work will take place, start/stop dates and the prime/sub contractor performing the work. The activities in the schedule shall coordinate with the Activity Hazard Analysis requirement in section G above.

- C. Safety/Activity Hazard Analysis Meeting - Activity Hazard Analysis and Two Week Look-Ahead Schedule coordination will be part of the weekly Construction meeting. In addition to the weekly construction meeting, the facility management requires a briefing to review the Project's Activity Hazards one week before the work shall occur. This meeting typically takes 30 minutes or less and is held on Wednesday at 1:00pm unless a different time is agreed to by the RE. Contractor's superintendent and key subcontractors (as applicable) are expected to attend and explain work activity/safety protocols.

### 3.9 LOCAL PERMITS

- A. A building permit is not required.
- B. This project is designed in accordance with the International Building Code, the International Plumbing Code, and the National Electric Code. The Contractor shall perform all work in compliance with the latest edition of these codes.

**3.10 TESTING**

The Contractor shall arrange and pay for the services of Independent Testing Laboratories/Engineers to perform specified services and testing as required.

**PART 4 – QUALITY ASSURANCE**

**4.1 SUBMITTALS**

Submittals required include, but are not necessarily limited to, the following:

- A. Procedures for processing shop drawings, samples, certificates, and other submittals shall be developed and submitted for approval as part of the Contractor's Quality Control Plan. The procedures shall include the establishment of responsibilities to assure at each level adequate review and approval; timely delivery, including verification procedures; and proper storage.
- B. Quality control records

**4.2 CERTIFICATION**

The Contractor shall certify that, the submittals comply with contract requirements. Submittals shall be as specified in Section 01300 SUBMITTALS.

**4.3 GOVERNMENT APPROVED SUBMITTALS**

Submittals requiring Government approval will be identified as having received Contractor approval by being so stamped and dated. Delays in the approval process shall not be the basis for consideration of a time extension when such delay is the result of the Contractor's failure to make proper and timely submittal or make corrections in accordance with the specifications or the Contracting Officer's comments or is the result of a resubmittal which is required because of an unsatisfactory original submittal. Approval action will not relieve the Contractor of his responsibility for compliance with the contract but will indicate only that the general method of construction and detailing is satisfactory.

**4.4 DEVIATIONS**

All proposed deviations from contract requirements shall be clearly indicated and submitted in writing for approval.

**\* \* \* END OF SECTION \* \* \***

**SECTION 01040**

**CUTTING AND PATCHING**

**PART 1 – GENERAL**

**1.1 SCOPE**

Requirements included - Contractor shall be responsible for all cutting, fitting and patching, required to complete the work or to:

- A. Remove and replace defective work.
- B. Remove and replace work not conforming to requirements.

**PART 2 – MATERIAL**

**2.1 MATERIALS**

Comply with specifications and standards for each specific product involved

**PART 3 – EXECUTION**

**3.1 INSPECTION**

- A. Inspect existing conditions of project.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to the RE in writing; do not proceed with work until the RE has provided further instructions.

**3.2 PREPARATION**

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of project from damage.
- C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.

**3.3 PERFORMANCE**

- A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

- B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerance and finishes.

#### **PART 4 – QUALITY ASSURANCE**

##### **4.1 SUBMITTALS**

- A. Submit a written Request for Information (RFI) to the RE per Div 01300 - SUBMITTALS:
  - 1. Work of the Government or any separate contractor.
  - 2. Structural integrity of any element of the Project.
  - 3. Integrity of weather-exposed or moisture- resistant elements or systems.
  - 4. Efficiency, operational life, maintenance or safety of operational elements.
  - 5. Visual qualities of sight-exposed elements.
- B. Request shall include:
  - 1. Identification of the Project.
  - 2. Description of affected work.
  - 3. The necessity for cutting, alteration, or excavation.
  - 4. Effect on work of Government or other work, or on structural or weatherproof integrity of the affected element.
- C. Description of proposed work:
  - 1. Scope of cutting, patching, alteration, or excavation.
  - 2. Trades who will execute the work.
  - 3. Products proposed to be used.
  - 4. Extent of refinishing to be done.
  - 5. Alternatives to cutting and patching.
  - 6. Cost proposal, when applicable
  - 7. Written concurrence of any separate contractor whose work will be affected.
- D. Should conditions of work or the schedule indicate a change of products from original installation, Contractor shall submit request for substitution as specified in Section 01090, "Materials and Equipment."
- E. Submit written notice to the RE designating the date and time the work will be uncovered.

**\* \* \* END OF SECTION \* \* \***

**SECTION 01080**

**TEMPORARY FACILITIES**

**PART 1 – GENERAL**

**1.1 REQUIREMENT INCLUDED**

- A. Furnish, install and maintain temporary facilities required for construction; remove on completion of the work.
- B. Facilities include, sanitary, water, electricity, lighting, heating, ventilation, telephone, construction aids, barriers, project signage, parking and site access.

**1.2 RELATED REQUIREMENTS**

- A. Section 01020: Site Access, Construction Limits, Use of Facilities and Work Hours.
- B. Section 01750: Protection of Existing Conditions and Installed Work

**1.3 REFERENCES**

- A. Occupational Safety and Health Standards for Construction (29 CFR PART 1926)
  - 1. Subpart G - Signs, Signals and Barricades
  - 2. Subpart L - Scaffolds
  - 3. Subpart M - Fall Protection
  - 4. Subpart N - Cranes, Derricks, Hoists, Elevators and Conveyors
  - 5. Subpart X - Stairways and Ladders

**PART 2 – MATERIAL**

**2.1 TEMPORARY SANITARY FACILITIES**

- A. The Contractor may use the existing facilities.
- B. Maintain in a clean and sanitary condition; failure to do so will result in a loss of privileges.

**2.2 TEMPORARY WATER**

- A. The existing building water system may be used for construction purposes at no cost to the Contractor. Obtain location connections from the RE. Extend system as necessary to comply with temporary water requirements.

**2.3 TEMPORARY ELECTRICAL POWER**

- A. Reasonable amounts of electrical power will be furnished at no cost. Contractor will have to supply breakers. Connections to the existing facility electrical system at any other point are prohibited.

- B. The Contractor shall provide a fused disconnect switch at the point of connection.
- C. The Contractor shall provide all supply lines for lights and power, extension outlets, and extension cords, trailers, receptacles, bulbs, fuses and other equipment required for safety and for proper execution of the work, and for inspection purposes.

#### **2.4 TEMPORARY LIGHTING**

Provide temporary artificial lighting for all areas when natural light does not meet minimum requirements for:

- A. Construction Areas: Uniform illumination of 20 foot-candles.

#### **2.5 TEMPORARY VENTILATION**

- A. Temp Ventilation not used required for odor control see section 02070-1.4 D. Air Quality Plan

#### **2.6 TEMPORARY TELEPHONE**

If necessary, the Contractor shall arrange with local telephone Service Company to provide their own direct line service for use of personnel and employees.

#### **2.7 CONSTRUCTION AIDS**

- A. Furnish, install and maintain required construction aids. Remove on completion of work.
- B. Provide construction aids and equipment required by personnel and to facilitate execution of the work i.e. trench boxes, scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

#### **2.8 TRASH REMOVAL**

- A. Contractor shall furnish and maintain a dumpster with a lid for trash removal. The dumpster shall be located in the contractor staging area. The Contractor shall be responsible removing all construction debris including any construction debris that may be dislodged from the dumpster due to the lack of securing the dumpster lid.

#### **2.9 BARRIERS**

- A. Furnish, install and maintain suitable barriers as required to prevent public entry, and to protect the work, existing facilities, trees and plants from construction operations; remove when no longer needed, or at completion of work.
- B. Materials of Contractor's option, as appropriate to serve required purpose and approved by RE.
- C. Where any removal, drilling or cutting of walls or other surfaces in areas of existing facilities operations occurs, the Contractor shall install temporary partitions prior to



demolition to prevent entrance of dust or other matter into the working areas. Where normal activities are to be carried on inside the building adjacent to the partition, the partition shall be thermally insulated and acoustically treated to prevent entry of temperature extremes and construction noise.

## **2.10 TEMPORARY PARKING AND ACCESS**

- A. Provide and maintain all vehicular access to site and within site to provide uninterrupted access:
  - 1. To temporary construction facilities, storage and work areas.
  - 2. For use by persons and equipment involved in construction project.
  - 3. For use by emergency vehicles.
- B. Locate roads, drives, walks and parking facilities to provide uninterrupted access to construction offices, mobilization, work, storage areas, and other areas required for execution of the contract.
  - 1. Contractor and the contractor's personnel shall utilize the parking areas designated by the RE.
- C. Provide access for emergency vehicles.
  - 1. Maintain driveways a minimum of 15 feet wide between and around combustible materials in storage and mobilization areas.
- D. Maintain traffic areas free as possible of excavated materials, construction equipment, products, snow, ice and debris.
- E. Keep fire hydrants and water control valves free from obstruction and accessible for use.
- F. Maintain roads, walks and parking areas in sound, clean condition.
  - 1. Repair or replace any portions damaged during progress of construction work.
- G. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation.
  - 1. Remove and dispose of compacted materials to depths required by various conditions to be met in completed work.
- H. Restore areas to original or to specified conditions at completion of work.

**PART 3 – EXECUTION**

**3.1 UTILITY COSTS**

Consumption costs of the temporary power service and temporary water service furnished to the Contractor will be paid by the Government. Extension from the point of connection, including equipment, operation and attendance shall be paid for by the Contractor.

**3.2 MAINTENANCE**

All costs in connection with the maintenance of all temporary facilities shall be paid by the Contractor.

**3.3 COMPLIANCE**

All work covered in this section shall comply with provisions of other applicable divisions and all applicable local requirements

**3.4 OPERATION OF PERMANENT EQUIPMENT**

Use of permanent equipment by the Contractor is strictly prohibited without written approval of the FAA prior to use.

**PART 4 – QUALITY ASSURANCE**

**4.1 SUBMITTALS**

Submittals required include, but are not necessarily limited to, the following:

**A. Barriers**

**\* \* \* END OF SECTION \* \* \***

**SECTION 01090**

**MATERIALS AND EQUIPMENT**

**PART 1 – GENERAL**

**1.1 SCOPE**

- A. Material and equipment incorporated into the work:
  - 1. Conform to applicable specifications and standards.
  - 2. Comply with size, make, type and quality specified, or as specifically approved in writing by the CO.
  - 3. Manufactured and Fabricated Products: Design, fabricate and assemble in accordance with the best engineering and shop practices.
  - 4. Do not use material or equipment for any purpose other than for which it is designed or is specified.
  - 5. All materials install for this project shall be free of asbestos and lead based paint.

**1.2 APPLICABLE DOCUMENTS**

- A. Part I, Section E, F, G.
- B. Section 01300 - Submittals
- C. Occupational Safety and Health Standards for Construction (29 CFR PART 1926) Subpart H - Materials Handling, Storage, Use and Disposal

**1.3 SUBMITTALS**

Submittals required include, but are not necessarily limited to, the following:

- A. Manufacturer's Instructions
- B. Contractor shall provide written certification that no Asbestos or LBP was used on this project.

**1.4 MANUFACTURER'S INSTRUCTIONS**

- A. When Contract Documents requires that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to the RE.
- B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
  - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the RE for further instructions.

2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

#### 1.5 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
  1. Deliver products in undamaged condition, in manufacturer's original containers or packing, with identifying labels intact and legible.
  2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packing.

#### 1.6 STORAGE

- A. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.
  1. Store products subject to damage by the elements in weather tight enclosures.
  2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- B. Arrange storage in a manner to provide easy access for inspection

### PART 2 – MATERIAL

NOT USED

### PART 3 – EXECUTION

NOT USED

### PART 4 – QUALITY ASSURANCE

#### 4.1 SUBMITTALS

Submittals required include, but are not necessarily limited to, the following:

- A. Manufacturer's Instructions

**\* \* \* END OF SECTION \* \* \***

**SECTION 01300**

**SUBMITTALS**

**PART 1 – GENERAL**

Applicable provisions of this Section and other provisions and requirements of the Contract Documents apply to all sections, except as modified in Sections of Divisions 2 through 16.

**1.1 SUMMARY**

Submit Shop Drawings, product data, samples, warranties, certificates, test reports as required by the contract documents.

**1.2 RELATED REQUIREMENTS**

- A. Section 01030: Contractor Quality Control, Coordination, Permits and Testing
- B. Section 01090: Materials and Equipment
- C. Section 01770: Closeout Procedures

**1.3 SUBMISSION REQUIREMENTS**

- A. Number of Copies - Submit prepaid and in ample time for approval before installation. Unless otherwise noted, submit four (4) copies of documents to the Resident Engineer (RE). Two (2) copies will be retained by the RE. If additional copies are required, provide the quantity and submit additional copies to meet this requirement.
- B. Time for Approval - Receive submittal approvals prior to starting the work. Time necessary for government approval or disapproval of samples, certificates, test reports, and shop drawings will not be more than twenty-one (21) calendar days after receipt of a submittal. All materials installed in the work shall match the approved submittals. After a submittal has been approved, no substitutions will be permitted without written approval by the RE. No extension of Contract Time will be authorized because of failure to transmit to the RE sufficiently in advance of the work to permit processing.
- C. Submittal Approval - The checking, marking or approval of the submittal by the FAA shall not be construed as a complete check, but will indicate only that the product or method of construction and detailing is satisfactory. Approval will not relieve the Contractor of the responsibility for compliance with the specifications or for any error which may exist. The Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work. Possible approval actions taken by the FAA include:
  - 1. Approved as submitted - If "approved as submitted" is marked by the RE, each copy of the submittal will be identified as having received such approval by being stamped and dated. After submittal has been approved, no substitutions will be permitted without written approval by the RE.

2. Approved as noted - If "approved as noted" is marked by the RE, the submittal is satisfactory contingent upon Contractor acceptance of corrections, notations, or both, and if accepted, does not require resubmittal.
  3. Not approved - If "not approved" is marked by the RE, the submittal data does not meet job requirements and the Contractor must resubmit. If the submittal is disapproved, the Contractor shall resubmit the corrected material in the same quantity as specified for the original submittal. Correct disapproved submittals and resubmit for approval by the RE. Approval of resubmittals requires an additional twenty-one (21) calendar days.
  4. Submittal Schedule - Identify within the Contractor's Construction Schedule a schedule of submittals for shop drawings, material approval, etc., showing the dates when submittals will be submitted for the project.
    - a) Contents - On the schedule indicate the following information:
      - 1) Schedule date for submittal
      - 2) Related Section number.
      - 3) Submittal category (Shop Drawings, Product Data, or Samples).
      - 4) Name of the subcontractor (if applicable)
      - 5) Description of the part of the work covered.
  5. Distribution - Following response to the initial submittal, print and distribute copies to the RE, Government, subcontractors, and other parties required to comply with submittal dates indicated. When revisions are made, distribute to the same parties. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.
  6. Schedule Updates - Revise the schedule after each meeting or activity where revisions have been recognized or made.
- D. Construction Progress Schedule – The progress chart to be prepared by the Contractor pursuant to the Contract Clause entitled "SCHEDULES FOR CONSTRUCTION CONTRACTS" shall consist of network analysis system, or pertchart (barchart). The Contractor shall be required to complete the work under the contract within the time frame noted in section 01000.
1. The diagram shall show a continuous activity flow from left to right. The diagram shall show the sequence in which the work is to be accomplished as planned by the Contractor.
  2. Dates shall be shown on the diagram for start of the project, any milestones required by the contract, and contract completion.
  3. The critical path shall be clearly identified.

4. Network activities shown shall include submittal and review of shop drawings and samples and procurement of materials and construction activities.
5. Government activities that affect progress shall be shown. These include but are not limited to: Notice-to-Proceed, approvals, and inspections.

NO PHYSICAL CONSTRUCTION WORK AT THE SITE MAY TAKE PLACE UNTIL THE CONTRACTOR SUBMITS AND THE GOVERNMENT APPROVES THE SCHEDULE. Government review of schedule submittal(s) will not exceed twenty-one (21) calendar days. Resubmittal, if necessary shall not exceed twenty-one (21) calendar days.

- E. Two-week "Look Ahead" schedule - This schedule may be of the Contractor's choosing, either bar chart or CPM form. Only activities scheduled to be occurring during the forecasted two week time periods are to be shown. Schedules shall be submitted weekly. Early and Late Start and Finish dates, and subcontractors involved are data to be included in the schedule.
- F. Submittals - Submit shop drawings, material and equipment lists, and all other data required under various headings of these specifications necessary to permit commencement of work. RE will return the submittals within 21 calendar days after receipt, indicating approval or disapproval.
- G. Submittal Preparation - Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
  1. Transmittals - All submittals shall be accompanied by transmittal letters identifying the contents of the submittal. It shall be clearly indicated on the transmittal letter with a statement and signature of the Contractor that the submittal item was verified for compliance with the contract requirements and approved by the Contractor. Transmittal letters shall consist of one original.
  2. Contents - Submittals shall be complete and detailed and assembled into sets. Lack of completeness or clarity or inadequate description will be justification for disapproval. Submittals shall bear the following information:
    - a) Name of project or facility and contract number;
    - b) Date of submission;
    - c) Contract drawing number and latest revision;
    - d) Specification page and paragraph number;
    - e) Name of Contractor and subcontractor or supplier/manufacturer;
    - f) Clearly identified contents and location of work;
    - g) Any proposed variances to specification requirements;
    - h) Contractor's approval certifying he checked and coordinated the work of other trades.
- H. Submittal Log – Contractor shall keep an up-to-date submittal log to be coordinated with the RE.



**1.4 SHOP DRAWINGS**

- A. Applicable Documents -
- B. Presentation - Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, building wing and section shown on contract drawings.
  - 1. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
  - 2. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings.
- C. Contents - Provide the following information on each submittal:
  - 1. Submittal number – Submittal number shall be shall take the form of the following: Specification Section-Paragraph-Item number (i.e. 09900-2.4-A).
  - 2. Date of submission
  - 3. Name of project and facility (full name)
  - 4. Name of Contractor or Subcontractor
  - 5. Reference to drawing number (with revision, if applicable) and/or specification section
  - 6. Clearly identify contents and location of work
  - 7. Contractor's approval certifying he checked and coordinated the work of other trades
  - 8. Dimensions.
  - 9. Identification of products and materials included by sheet and detail number.
  - 10. Compliance with specified standards.
  - 11. Notation of coordination requirements.
  - 12. Notation of dimensions established by field measurement.
  - 13. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches.
- D. Submittal - Submit blue or black-line prints for the RE's review. Submit the number of copies the Contractor requires, plus two which will be retained by the RE.
  - 1. One of the prints returned shall be marked up and maintained as a "Record Document."
  - 2. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

**1.5 PRODUCT DATA**

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation

instructions, catalog cuts, Material Safety Data Sheets (MSDS), standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

**B. Preparation**

1. Clearly mark or highlight each copy to identify pertinent site specific products or models the Contractor intends to use
2. Highlight/clearly indicate all performance characteristics and capacities
3. Highlight/clearly indicate all dimensions and clearances required

Note: If the submittal is not clearly marked, regarding the above pertinent data, the submittal will be returned marked "DISAPPROVED".

**1.6 MATERIAL SAFETY DATA SHEETS (MSDS)**

- A.** Provide manufacturer's material safety data sheets for each product specified.

**1.7 SAMPLES**

- A.** Submit three (3) of each sample approved for installation. Submittals include all components of the materials to be used to correct the roofing system as specified and physically identical with the material or product proposed.

- B.** Display - For each sample include the following:

1. Generic description of the sample.
2. Sample source.
3. Product name or name of the manufacturer.
4. Availability and delivery time.

- C.** Records - Maintain sets of samples at the project site, for quality comparisons throughout the course of construction.

1. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
2. Sample sets may be used to obtain final acceptance of the construction associated with each set.

**1.8 WARRANTIES/GUARANTIES**

- A.** Assemble two (2) copies with original signatures of warranties executed by each of the respective manufacturers, suppliers, and subcontractors into a warranty book and prepare a Table of Contents.

- B.** Additional Data - Provide complete information for each item, include the following:

1. Product or work team
2. Firm, with name of principal, address, and telephone
3. Scope

4. Effective dates of warranty based on Final Acceptance of the item.
5. Information for Owner's personnel on proper procedures to evoke the warranty in case of failure and instances which might affect the validity of warranty.

C. Warranties - Effective after project completion and acceptance by the FAA (CAI).

#### 1.9 CERTIFICATES

Assemble certificates executed by each of the respective manufacturers, suppliers, and subcontractors.

- A. Additional Data - Provide complete information for each item to certify compliance with contract documents.
1. Product or work item
  2. Firm, with name of principal
  3. Scope of compliance
  4. Signature by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

#### PART 2 – MATERIAL

NOT USED

#### PART 3 – EXECUTION

##### 3.1 GENERAL

Submittals are required for the items listed in the specifications or on the drawings. The following is a partial list of submittals required: Schedules, Manufacturer's Literature, Shop Drawings, Samples, Test Reports, Warranties, Certificates, Design Calculations, MSDS, and Installation Instructions. It should not be construed as a complete list of all submittals required. Submittal dates shall comply with this specification unless a more stringent date is specified. Substitutions and all requested changes will require a submittal.

##### 3.2 SCHEDULE

For the following particular submittals under Division 1, the submittals must be approved prior to any work on site. For the following submittals of Divisions 2 thru 16, the submittals must be approved prior to any work on site involving the corresponding specification section listed.

#### PART 4 – QUALITY ASSURANCE

##### 4.1 SUBMITTALS

Submittals required include, but are not necessarily limited to, the following:

- A. Submittal schedule

- B. Construction progress schedule
- C. Submittal log

**\* \* \* END OF SECTION \* \* \***

(add additional activities as required)											
<b>06 WOOD &amp; PLASTICS</b>											
06.1 Labor											
06.2 Material											
(add additional activities as required)											
<b>07 THERMAL &amp; MOISTURE PROTECTION</b>											
07.1 Materials											
07.2 Labor											
(add additional activities as required)											
<b>09 FINISHES</b>											
09.1 Materials											
09.2 Labor											
(add additional activities as required)											
<b>11 EQUIPMENT</b>											
11.1 Materials											
11.2 Labor											
(add additional activities as required)											
<b>15 MECHANICAL</b>											
15.1 Materials											
15.2 Labor											
(add additional activities as required)											
<b>16 ELECTRICAL</b>											
16.1 Materials											
16.2 Labor											
(add additional activities as required)											
<b>Legend:</b> Scheduled Start ○ Actual Start ● Scheduled Completion △ Actual Completion ▲ Original ◇--- <b>0/100: 100% @ Completion    50/50: 50% @ Start 100% @ Compl.    LOE: Fixed amt every month    Proport. Equal %age/month</b>											

CONTROL ACCOUNT PLANNING SHEET												Line Totals
Description	All values in Dollars											
01 GENERAL REQUIREMENTS												
050.01.1 Insurance and bonds												\$0
050.01.2 Mobilization												\$0
050.01.3 Gen'l Cond. (Supv, trailers, utilities, field exp.)												\$0
02 SITE WORK												
050.02.1 Asbestos Demolition - M1												\$0
050.02.2 Asbestos Demolition - M1Attic												\$0
05 METALS												
050.05.1 Labor												\$0
050.05.2 Material												\$0
(add additional activities as required)												
06 WOOD & PLASTICS												\$0
050.06.1 Labor												\$0
050.06.2 Material												
050.12 (add additional activities as required)												\$0
07 THERMAL & MOISTURE PROTECTION												
050.07.1 Materials												\$0
050.07.1 Labor												\$0
(add additional activities as required)												
09 FINISHES												
050.09.1 Materials												\$0
050.09.1 Labor												\$0
(add additional activities as required)												
11 EQUIPMENT												
050.11.1 Materials												
050.11.1 Labor												
(add additional activities as required)												
15 MECHANICAL												
050.15.1 Materials												\$0
050.15.2 Labor												\$0
(add additional activities as required)												
16 ELECTRICAL												
050.16.1 Materials												\$0
050.16.2 Labor												\$0
(add additional activities as required)												

Monthly Status	Month1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	Budget at Complete
Planned Cost	0	0	0	0	0	0	0	0	0	0	0	0	\$0
Actual Cost	0												
Earned Value	0												
Schedule Variance (Earned-Planned)	0												
Cost Variance (Earned-Actual)	0												
Schedule Performance Index (Earned/Planned)	#DIV/0!												
Cost Performance Index (Earned/Actual)	#DIV/0!												
Performance Index >or = 1.0 Favorable; <1.0 Unfavorable													
Cummulative Status													
Planned Cost	0	0	0	0	0	0	0	0	0	0	0	0	
Actual Cost	0												
Earned Value	0												
Schedule Variance	0												
Cost Variance	0												
Schedule Performance Index	#DIV/0!												
Cost Performance Index	#DIV/0!												

# Instructions

Step 1. Break down the work into month or two month blocks. The result is the Work Breakdown Structure (WBS). The divisions of the specifications should be the framework.

**SECTION 01400**

**EARNED VALUE REPORTING**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

Earned Value Management - In order to provide project planning and control the project network analysis system shall incorporate Earned Value Management (EVM) methodology. The current standard for EVM is the ANSI/EIA Standard 748.

**1.2 EVM INSTRUCTIONS**

- A. Baselining - A spreadsheet template and example that can be run on a standard Windows personal computer will be provided. Portions of the template are shown in Figures 1-01400 and 2-01400.
1. Break down the work into month or two month blocks. The result is the Work Breakdown Structure (WBS). The standard construction divisions should be the framework. The WBS makes up the left hand columns of the worksheets.
  2. Create the project schedule submittal using the WBS as the basis. Highlight start and completion milestones in the Milestone Status Sheet.
  3. Fill in the Cost Control Sheet by time-phasing the dollar amounts from the bid to the milestones. These allow progress tracking to be very objective. These are baselined and become the Planned Costs

**1.3 EVM MONTHLY REPORTING**

1. After the end of each month, the Contractor and the Resident Engineer will evaluate which milestones were achieved. The baselined amounts for milestones achieved are claimed as Earned Value and shall be submitted to the Contracting Officer along with the progress payment.
2. Progress payments are processed as normal and those amounts are added in as the Actual Costs. Variances are analyzed, forecasts are made, impacts assessed and corrective action plans developed and implemented.

**PART 2 – MATERIAL**

NOT USED

**PART 3 – EXECUTION**

NOT USED

**PART 4 – QUALITY ASSURANCE**

**NOT USED**

**\* \* \* END OF SECTION 01400 \* \* \***

## SECTION 01730

### OSHA SAFETY REQUIREMENTS

#### PART 1 – GENERAL

##### 1.1 SCOPE

- A. This section identifies some of the requirements of the OSHA Construction Standard.
- B. Formulation of a site specific safety plan

##### 1.2 CONTRACTOR RESPONSIBILITY

- A. General Safety Provisions - The Contractor shall bear full responsibility to provide safe working conditions for its employees and Subcontractors. The Contractor shall not permit any employee or subcontractor to work in surroundings or under working conditions that are unsanitary, hazardous, or dangerous to the health and safety of the employee.
- B. Accident Prevention - The Contractor shall bear the responsibility of maintaining an accident prevention program such that frequent and regular inspections of the job site, materials and equipment are made by a competent person designated by the employer.
- C. Use of Equipment - The Contractor shall not permit the use of any machinery, tool, material, or equipment that is not in compliance with OSHA regulations. The employer shall permit only those employees qualified by training and/or experience to operate equipment and machinery.
- D. MSDS Sheets - Adhesives sealants and primers used produce odorous vapors which are a tremendous concern with the Air Traffic Controllers. Submit applicable MSDS sheets of adhesives, paints, sealants, and other VOC producing materials.

##### 1.3 CONTRACTOR RESPONSIBILITY

- A. The FAA shall not be held responsible for safety inspections to assure Contractor conformance with the OSHA safety regulations. The FAA, however, reserves the right to notify the Contractor of any deficiencies regarding worker safety.
- B. The FAA will evaluate the Contractor on its safety performance, including that of its Subcontractors. The number and severity of safety and security violations will be considered in this evaluation. Contractor safety violations are cause for termination for default, may result in notification of the Contractor's bonding company, and will affect the Contractor's opportunity to propose on future work. Failure to correct such deficiencies may impact the Contractor's ability to work on future FAA contracts.



**1.4 OSHA REGULATIONS**

- A. The Contractor shall comply with the latest Occupational Safety and Health Administration regulations (CFR 29 Part 1926) regarding safety in the work area.
- B. The Contractor shall be responsible for obtaining copies of non-FAA referenced documents without additional cost to the FAA. If Contractor requests, a copy of FAA directives may be obtained by contacting the Contracting Officer.
- C. The Contractor is not relieved from adhering to other OSHA requirements not listed herein. The Contractor shall consult the latest referenced OSHA documents for safety regulations.
  - 1. Documents:
    - a) OSHA Documents:
      - 1) CFR 29 Part 1926 Safety and Health Regulations for Construction
      - 2) CFR 29 Part 1910 General Industry Standards Applicable to Construction Industry
    - 2. FAA Documents:
      - a) FAA Order 3900.49 Control of Hazardous Energy During Maintenance, Servicing and Repair.
      - b) FAA Order 3900.19B Occupational, Health & Safety Program

**1.5 SAFETY PLAN**

The Contractor must develop and implement a site specific comprehensive Health and Safety Plan (HASP) based on the scope of work, for his or her employees as well as others in the area and the properties around. It shall cover all aspects of onsite construction operations and activities associated with the contract. This plan must comply with 29 CFR 1926, FAA Order 3900.19B, other applicable health and safety regulations and any project-specific requirements. The Contractor must provide the Contracting Officer with a copy of this plan. Acceptance of the Contractor's HASP only signifies that the plan generally conforms to the requirements of the contract. It does not relieve the Contractor of the responsibility for providing with a safe and healthful work environment. At a minimum the HASP shall address the following:

- A. Workplace address
- B. Name and address of the principal contractor
- C. Key Personnel, phone nos and addresses
- D. Estimated duration of the work
- E. Hazard assessment and identification of the hazards in the scope of work
- F. Mitigation of hazards and proposed control measures for the risks

- G. Hazard Communication methods
- H. How the controls will be implemented
- I. Personal Protective Equipment
- J. Training
- K. Temperature Extreme
- L. Medical Surveillance
- M. Exposure Monitoring and Air Sampling
- N. Site Control
- O. Emergency Response/Contingency Plan
- P. Emergency Action Plan
- Q. Confined Space Entry
- R. Spill Containment
- S. Documentation and Record Control
- T. Arrangements for monitoring and reviewing controls

The plan must be written so it is easy to understand, signed and dated by the General Contractor. It must be available for the length of the project. The General Contractor cannot allow work to start unless the plan has been discussed with or a copy given to all relevant people and the plan is readily available for inspection. The plan must be amended if there are changes in how risks will be managed. The General Contractor must inform any affected person of the change.

## PART 2 – MATERIAL

NOT USED

## PART 3 – EXECUTION

### 3.1 CFR 29 PART 1926 -- SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

- A. This section contains a partial listing of the referenced OSHA standards. The Contractor is responsible for adhering to all applicable regulations including those not specifically referenced herein.
  - 1. Subpart D (Occupational Health and Environmental Controls) - Contractor shall furnish adequate supply of potable water in containers clearly marked as potable

- water. Containers containing non-potable water shall be clearly marked. Contractor shall furnish toilet facilities based on the number of employees present on the job-site. A minimum of 1 facility is required for less than 20 employees. See CFR 29 Part 1926 Subpart D for complete requirements.
2. Subpart E (Personal Protective Equipment) - The Contractor shall provide adequate protection for the head, hearing, and eyes for all employees working in an area where hazards to the head, ear and eyes exist. See CFR 29 Part 1926 Subpart E for complete requirements.
  3. Subpart I (Tools) - All hand tools and power tools and similar equipment whether furnished by the Contractor or the employee shall be maintained and operated in a safe condition. Personal protection shall be used when applicable. The use of tools shall be limited to the intended use of said tools. See CFR 29 Part 1926 Subpart I for complete requirements.
  4. Subpart K (Electrical) - The Contractor shall furnish ground fault protection for all electrical equipment used on the jobsite. Extension cords shall be three wire ground in good shape. Installation of the facilities will require energizing numerous circuits. The Contractor shall protect against electrical shock by methods such as posting warning signs, supplying insulated gloves, locking out and tagging de-energized circuits, and other similar methods. See CFR 29 Part 1926 Subpart K for complete requirements.

3.2 CFR 29 PART 1910 -- GENERAL INDUSTRY STANDARDS APPLICABLE TO CONSTRUCTION INDUSTRY

- A. This section contains a partial listing of the referenced OSHA standards. The Contractor is responsible for adhering to all applicable regulations including those not specifically referenced herein.
1. Section 1910.147 - Contractor shall maintain a written hazardous energy control procedure in accordance with CFR 29 1910.147. The written procedure shall describe contractor's responsibilities regarding shift changes or personnel changes. A specific coordinated lockout/tagout procedure shall be recorded in writing and signed by the Contractor and Contracting Officer with copies to each party. Lockout/tagout shall be coordinated with the facility and the plan shall be submitted.
  2. Section 1910.120 - The Contractor shall develop and implement an Emergency Response and Contingency Plan in accordance with OSHA Standard 29 CFR 1910.120. In the event of an emergency associated with remedial action, the Contractor shall, without delay, take diligent action to remove or otherwise minimize the cause of the emergency; alert the Contractor; and institute whatever measures might be necessary to prevent any repetition of the conditions of actions leading to, or resulting in, the emergency. Emergency contact names and telephone numbers shall be posted at all project phones and in site-support vehicles as well as included within the plan. The Emergency Response and Contingency Plan shall be submitted.

3.3 FAA ORDER 3900.19B – OCCUPATIONAL HEALTH AND SAFETY PROGRAM

- A. The contractor shall all sections of this Order pertaining to the work of under this contract including, but not limited to the following:
  - 1. Chapter 34 Electrical Safety – All energized electrical work shall conform to OSHA standards and latest edition of NFPA 70E. All energized electrical work shall be performed under an energized work permit except as noted in NFPA 70E. The energized work permit shall be submitted to the COTR (RE) for reviewed.

PART 4 – QUALITY ASSURANCE

4.1 SUBMITTALS

Submittals required include, but are not necessarily limited to, the following:

- A. Contractor Safety Plan – FAA to keep 1 copy

**\* \* \* END OF SECTION \* \* \***

**SECTION 01750**

**PROTECTION OF EXISTING CONDITIONS AND INSTALLED WORK**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

This section includes the basic care the Contractor shall use to prevent unnecessary damage to property in or near the worksite during performance of the work.

**1.2 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, AND FACILITIES**

- A. The Contractor shall take all precautions necessary to protect the existing facilities, equipment, buildings, and vegetation during construction. Any areas damaged shall be repaired or replaced at no additional cost to the FAA. Repairs shall be approved by the RE. All repairs shall match the original finish and be made utilizing materials equal in quality to the existing.
- B. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the RE.
- C. The Contractor shall protect from damage all existing improvements and utilities at or near the worksite. The locations of which are made known to or should be known by the Contractor.

**1.3 PROTECTION OF CRITICAL DATA CENTER**

Contractor is working in a critical data center requires that a detailed plan for protection of equipment, control of dust and debris and clean up be submitted for approval by the facility before any work can commence. Submit facility and equipment protection plan for approval.

**1.4 PROPERTY PROTECTION**

- A. Unnecessary damage is that which can be avoided through efficient and careful performance of the work in a careful manner. If the Contractor damages any property, the Contractor shall at once notify the RE and may make or arrange to make prompt and full restitution.
- B. Maps and specifications provided by the FAA may not give the location of all water supply, drainage, irrigation, and other underground facilities. The Contractor shall avoid damaging or obstructing these facilities or polluting water supplies.

- C. The Contractor shall hold the FAA harmless from any and all suits, actions, and claims for damages, including environmental impairment, to property arising from any act or omission of the Contractor, its Subcontractors, or any employee of the Contractor or Subcontractors, in any way related to the work or operations under this contract.
- D. The Contractor shall indemnify and hold harmless the FAA lawfully in possession against all claims or liabilities asserted by third parties, including all governmental agencies, resulting directly or indirectly from the Contractor's wrongful or negligent acts or omissions.
- E. The Contractor shall maintain all roads used by it, and upon completion of the job shall leave them in as good a condition as when first used.

#### **1.5 MANAGEMENT AND DISPOSAL OF HAZARDOUS WASTES**

- A. The management and disposal of hazardous wastes and materials exposes the Contractor and FAA to short and long-term liabilities. In order to reduce these potential liabilities it is critical that the Contractor be fully aware of the hazards and regulatory requirements associated with the hazardous materials involved in this project. Only qualified personnel shall be used in their handling and transportation. Before commencing work, the Contractor shall:
  - 1. Perform an environmental assessment of the work required under the contract identifying tasks which involve the use, handling or transportation of hazardous materials or wastes. Submit an environmental plan identifying and dealing with each specific task involving the wastes. The plan must be specific enough to demonstrate a thorough understanding of the environmental risks and the appropriate methodology for dealing with them. The plan shall also list the required permits and reference the relevant regulations which govern the activities involved in dealing with the materials or wastes.
  - 2. Meet with representatives of the FAA during the preconstruction conference to discuss and to develop a mutual understanding on implementation of the plan.
  - 3. The Contractor may require other tasks to be added to the plan. Work involving hazardous materials or wastes shall not commence until adequate plans have been submitted and reviewed. FAA's review of the Contractor's plan shall in no way relieve the Contractor of its liability for environmental law and regulatory compliance.

#### **1.6 PROTECTION OF INSTALLED WORK**

- A. Protect installed work. Provide special protection where required in the Specifications and drawings or under manufacturer's warranty.
- B. Provide temporary and removable protection for installed products. Control activities in immediate work area to prevent damage.
- C. Protect finished floors and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

- D. Prohibit traffic or storage upon completed surfaces. Obtain protection instructions from the manufacturer if traffic or activity is necessary.

**PART 2 – MATERIAL**

**NOT USED**

**PART 3 – EXECUTION**

**NOT USED**

**PART 4 – QUALITY ASSURANCE**

**NOT USED**

**\* \* \* END OF SECTION \* \* \***

**SECTION 01760**

**ORDERLY WORKSITE AND SITE CLEANUP**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

This section sets out the basic Contractor requirements for maintaining an orderly and clean worksite.

**1.2 BASIC REQUIREMENTS**

- A. The worksite, including storage areas, shall be kept clean and orderly during progress of the work. The Contractor shall be personally responsible for the storage of tools and materials. The Contractor shall and shall require each subcontractor engaged upon the work to bear full responsibility for cleaning up during and immediately upon completion of their work.
- B. The Contractor shall provide on-site containers for the collection of waste material, debris and rubbish and periodically remove as required or at the direction of the RE. Any spillage on access or haul routes shall be cleaned up immediately. All spoil, waste, or debris removed from the work site and not specified for reuse or identified as salvageable items, shall become the property of the Contractor and shall be disposed of off site in areas authorized by the applicable County, State and/or Local agencies and in accordance with current rules and regulations governing the disposal of such waste. Disposal fees and miscellaneous charges shall be paid by the Contractor.
- C. Unless specifically set forth in the Contract, burning is not permitted for the disposal of refuse and debris. All rubbish, waste, tools, equipment, and other apparatus caused by or used in the execution of the work shall be removed. This shall in no way be construed to relieve the Contractor of its primary responsibility for maintaining the facilities and the site clean and free of debris, and leaving all work in a clean and proper condition acceptable to the RE.
- D. Immediately after unpacking, all packing material, case lumber, wrappings, or other rubbish, flammable or otherwise, shall be collected and removed from the building and the premises.

**PART 2 – MATERIAL**

**NOT USED**



**PART 3 – EXECUTION**

**3.1 PROGRESS CLEANING AND WASTE REMOVAL**

- A. Remove all rubbish, waste, tools, equipment, and appurtenances used from the worksite at the end of each day to maintain egress, safety, and sanitation.
- B. Remove debris and rubbish from closed or remote spaces before enclosing the space. Collect and remove waste materials, debris, and rubbish from site, and dispose of off-site.
- C. Sweep and vacuum clean interior areas before start of surface finishing and continue cleaning daily to eliminate dust.

**3.2 OVERALL CLEANING**

- A. Immediately before the final inspection, the entire exterior and interior of any building and the surrounding areas shall be thoroughly cleaned by the Contractor, including but not limited to the following:
  - 1. All construction facilities, debris, and rubbish shall be removed from any building and the site.
  - 2. All surfaces within any building shall be swept, dusted, vacuumed, washed, or polished as required.
  - 3. All tools, scaffolding, temporary utility connections or buildings, belonging to the Contractor, or used under his/her direction, shall be removed from the site.

**3.3 FINAL CLEANING**

- A. Thoroughly clean entire worksite and exterior and interior of any building.
- B. Remove debris and rubbish from any building and the worksite.
- C. Finished surfaces within any building shall be swept, dusted, vacuumed, washed, or polished as required.
- D. Remove all tools, scaffolding, temporary utility connections or buildings belonging to the Contractor or its lower tier subcontractors from the Site.
- E. Reseed disturbed areas.

**PART 4 – QUALITY ASSURANCE**

**NOT USED**

**\* \* \* END OF SECTION \* \* \***

**SECTION 01770**

**CLOSEOUT PROCEDURES**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

This section sets out the requirements for contract closeout at completion of the work.

**1.2 FINAL SUBMITTAL REQUIREMENTS**

Prior to final acceptance, the Contractor shall assemble all appropriate warranties, product information, certifications, equipment installation instructions, MSDS sheets, and the results of all tests.

**1.3 COMPLETION CERTIFICATE**

A. When Contractor considers the work completed, Contractor shall submit a signed certification in the certifying the following:

1. Contract Documents have been reviewed and work inspected for compliance with the Contract, including Punchlist work, and accepted by the FAA.
2. All materials used in the project are asbestos and lead free.
3. Record Documents, As-Built, final project photographs, damage or settlement survey, property survey, Record Drawings and similar final record information as required and acceptable to the CO have been submitted by the Contractor.
4. Equipment/systems have been tested in the presence of the RE and are operational.
5. Required operational, and maintenance manuals, data and parts list have been submitted and approved.
6. Spare parts have been provided as required.
7. Warranties and guarantees have been prepared and found acceptable to CO.
8. Work is completed, premises cleaned and ready for inspection, temporary facilities and services have been removed, and pre-existing conditions have been restored.
9. All maintenance personnel have been properly instructed in the use of the facilities and all installed equipment as required by the Contract Documents.
10. Contractor has released all property installed in the performance of the contract and all GFE/GFP not used has been transferred to the FAA and delivered to place of origin.
11. Return of all Seattle Center identification badges and keys.

**1.4 CONTRACTOR ACCEPTANCE INSPECTION (CAI)**

A. The Contractor shall coordinate with the RE the date to schedule the CAI. The Contractor shall notify the CO in writing seven days (or as otherwise agreed to) before an agreed upon CAI date.

- B. The Contractor shall have the superintendent present at the CAI. The RE shall conduct an inspection of the facility to verify all contract conditions are met. Any additional required test results shall be submitted to the RE at this time. The RE reserves the right to have local FAA personnel conduct additional tests to verify that operational requirements are met. The FAA reserves the right to have personnel present to document any concerns regarding final condition of the Site.

**1.5 PUNCH LIST**

When the Contractor feels the project is ready for punch list, the RE shall be notified. The Contractor and RE shall perform the initial punch lists independent of one another. This list shall include but not be limited to a list of discrepancies in the work, material, and equipment that is unacceptable as a final product. The two lists will then be combined by the Contractor. The Contractor shall correct all deficiencies, if any, noted on the punch list before final acceptance. Each item on the punch list that is completed will be initialed and dated by the RE. Work showing evidence of substandard performance will not be accepted and shall be corrected by the Contractor at its expense.

**1.6 AS-BUILT DRAWINGS**

The Contractor shall maintain at the job site two sets of full-size contract drawings marked to show any deviations which have been made from the contract drawings, including buried and concealed construction and utility features revealed during the course of construction. These drawings shall be available for review by the Contracting Officer at all times. Upon completion of the work, deliver the marked sets of prints to the Contracting Officer. Requests for partial payments will not be approved if the marked prints are not current, and request for final payment will not be approved until the marked prints are delivered to the Contracting Officer.

**1.7 FINAL ACCEPTANCE OF WORK**

- A. The Contractor shall correct discrepancies noted on the punch list prior to the final acceptance. The premises shall be thoroughly clean prior to final acceptance. Contractor shall schedule final inspection and notify in writing the CO and RE seven days (or as otherwise agreed to) before the planned inspection date.
- B. Contractor shall have the superintendent present at the final inspection. The RE shall conduct the final inspection of the facility to verify all contract conditions are met.
- C. Upon acceptance by FAA, Contractor may submit Final Application for Payment

**PART 2 – MATERIAL**

NOT USED

**PART 3 – EXECUTION**

NOT USED

**SEATTLE ARTCC – AUTOMATION WING REHABILITATION  
(SECOND FLOOR AND ATTIC)**

**July 2009**

**PART 4 – QUALITY ASSURANCE**

NOT USED

**\* \* \* END OF SECTION \* \* \***

**SECTION 01782**

**OPERATION AND MAINTENANCE MANUAL DATA**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes requirements for Operation and Maintenance (O&M) manuals for hard copy and electronic/record documents, including the following:
  - 1. Prepare and submit operation and maintenance manuals for building operating systems and equipment.
  - 2. Project record document submittal.
  - 3. Provide O&M data to the Government for use in updating the Air Route Traffic Control Center (ARTCC) O & M Documents.
    - a) An inventory of each component and piece of equipment requiring operations and maintenance documentation identified in the specification and contract drawings shall be documented and provided to the COTR in worksheet format. Use Attachment 1 to this section to identify systems and sub-systems. Attachment 2 is the format that shall be used to document O&M equipment inventory information. COTR will provide guidance on how to complete worksheets.
- B. Related references for submitting information for operation and maintenance manuals:
  - 1. Appropriate Sections of Divisions 2 through 16 specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.
  - 2. D-2494 Technical Instruction Book Manuscript: Electronic, Electrical, and Mechanical Equipment Requirement for Preparation of Manuscript and Production of Books, Appendix I (COTS).

**1.2 QUALITY ASSURANCE**

- A. Maintenance Manual Preparation: In preparation of maintenance manuals, use competent/certified personnel thoroughly trained and experienced in operation and maintenance of equipment or systems involved.
  - 1. Provide O & M manuals prepared in accordance with this Section.
  - 2. Where specifications require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.
  - 3. Where specifications require drawings or diagrams, use personnel skilled in preparing drawings clearly in an understandable format.

**1.3 SUBMITTAL SCHEDULE**

- A. Submittal Schedule: Unless otherwise noted, comply with the following schedule for submitting operation and maintenance manuals:
1. 1. O&M Documentation for all Individual Items. Fifteen days after a product is received and before any Request for Payment Application will be approved, provide required documents as follows:
    - a. All items for which a submittal has been approved, and the item delivered to the project site shall have all product information (basic information, installation, start-up, operations and maintenance, parts lists, wiring diagrams and etc.) removed from the shipping packaging or equipment item and submitted by specification number to the site manager in the manufacturers originally packaged container (envelope, plastic bag, etc.) along with all other manufactures pertinent information (cut sheets, engineering data and etc.) which was included in the approved submittal package and was not included the shipping information package.
    - b. Five copies are required; If quantities of five like items are not required for the project, five additional of the original manufacturers O&M informational packages must be submitted with in 30 days of the initinal O&M submission. Photocopies or fax copies will not be accepted.
    - c. Each O&M submittal item shall include the manufacturer, supplier/vendor, installing contractor and service representative, complete name, address and phone number and email address of each item.
  2. Electronic imaging. Provide either scanned images or electronic files of O&M documentation in addition to the paper copies specified. Index scanned images and/or electronic files to facilitate organizing the electronic information in the same format as the final approved paper copies. Provide electronic information on CD-ROM.
- B. Form of Submittal: Prepare operation and maintenance manuals in the form of an instructional manual for use by the Government's operating personnel. Organize into sets in sizes as indicated. Organize O&M information by system as described in Schedule at end of Part 3 of this Section.
1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, maximum of 3 inches thick, sized to receive 8-1/2-by-11- inch paper. Provide a clear plastic sleeve on the spine and front cover to hold labels describing contents. Provide 3-hole punched, heavy-duty sheet protectors to hold folded oversized documents. Do not fill binders to more than 1/2 capacity.
    - a. Where multiple binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
    - b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with clear celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide a description of the Product and major parts of equipment included in the Section on each divider.
  3. Text Material: Provide the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, computer generated, on 8-1/2-by-11 inch, 20-lb/sq. ft. white bond paper.
  4. Drawings: Provide reinforced, punched binder tabs on drawings and bind with text. Where oversize drawings are necessary, fold drawings to the same size as text pages, and inserted in a 3-hole-punched, heavy-duty plastic sheet protector.
  5. Photos: Provide required photographs in digital and paper format. Photos shall be adequately labeled, printed and placed in 3-hole punch plastic protector sheets. Photos in electronic format shall be provided on floppy disks or CD-ROM.
  6. Software: Provide 3-hole punch plastic protector sheets for labeled software media, such as electronic photographs, text and equipment inventory worksheets.
- C. Submit 2 copies of each manual, in final form, on equipment and systems to the COTR for distribution. Include information for each unit of equipment, each operating system, and each electric and electronic system.
- D. Payment for Equipment: No payment will be made for equipment delivered for which O&M documentation has not been submitted and approved.

#### 1.4 MANUAL CONTENT

- A. Include information required by the individual Specification Sections in the form of Data Packages. Data packages shall be developed for each building component, piece of equipment and system based on level of complexity and as specified in the individual Specification Sections. Data packages shall be provided in accordance with Schedule at end of Part 3 of this Section. Applicability of data packages is as follows:
1. Data Package 1: General building materials and components including but not limited to:
    - a. Sealants.
    - b. Light Fixtures.
    - c. Door Hardware
    - d. Fire Stopping
  2. Data Package 2: Simple operating components including, but not limited to:
    - a. Valves.
    - b. Hatches.
    - c. Louvers.
    - d. Plumbing Fixtures.
  3. Data Package 3: Minor equipment including but not limited to:

- a. Small Pumps.
  - b. Fans.
  - c. Fin Tube Radiators
  - d. Variable Air Volume Boxes
4. Data Package 4: Major and complex equipment including but not limited to:
- a. AHU's.
  - b. Package AC Units.
  - c. Large Pumps.
  - d. Motors.
  - e. Chillers.
  - f. Boilers.
  - g. Switch Gear.
  - h. Control Systems.
  - i. Engine Generators.
  - j. Fire Alarm Systems.
  - k. Security Systems, etc.
- B. Provide Data Package information as follows:
1. Data Package 1:
- a. Safety Precautions.
  - b. Maintenance and Repair Procedures.
  - c. Spare Parts and Supply List.
  - c. Warranty Information.
  - d. Contractor Information.
2. Data Package 2:
- a. Safety Precautions.
  - b. Normal Operations.
  - c. Environmental Conditions.
  - d. Lubrication Data.
  - e. Preventive Maintenance Plan and Schedule.
  - f. Maintenance and Repair Procedures.
  - g. Removal and Replacement Instructions.
  - h. Spare Parts And Supply List.
  - i. Parts Identification.
  - j. Warranty Information.
  - k. Contractor Information.
3. Data Package 3:
- a. Safety Precautions.
  - b. Normal Operations.
  - c. Emergency Operations.



- d. Environmental Conditions.
  - e. Lubrication Data.
  - f. Preventive Maintenance Plan and Schedule.
  - g. Troubleshooting Guides and Diagnostic Techniques.
  - h. Wiring Diagrams and Control Diagrams.
  - i. Maintenance and Repair Procedures.
  - j. Removal and Replacement Instructions.
  - k. Spare Parts and Supply List.
  - l. Parts Identification.
  - m. Testing Equipment and Special Tool Information.
  - n. Warranty Information.
  - n. Contractor Information.
- 4. Data Package 4:
  - a. Safety Precautions.
  - b. Operator Prestart
  - c. Startup, Shutdown and Post-Shutdown Procedures.
  - d. Normal Operations.
  - e. Emergency Operations.
  - f. Operator Service Requirements.
  - g. Environmental Conditions.
  - h. Lubrication Data.
  - i. Preventive Maintenance Plan and Schedule.
  - j. Troubleshooting Guides and Diagnostic Techniques.
  - k. Wiring Diagrams and Control Diagrams.
  - l. Maintenance and Repair Procedures.
  - m. Removal and Replacement Procedures.
  - n. Spare Parts and Supply List.
  - o. Corrective Maintenance Man-Hours.
  - p. Parts Identification.
  - q. Testing Equipment and Special Tool Information
  - r. Personnel Training Requirements
  - s. Warranty Information.
  - t. Contractor Information
- C. Software: Specified program listings, interface control documents, source code listing, and copies of the operating programs on media appropriate to use as backup for the system software. Include instructions for loading the operating software onto the system.
- D. Additional requirements:
  - 1. For each system, general system or equipment description. Include size, weight, power consumption, power requirements, and outline drawings.
  - 2. Copies of applicable Shop Drawings, Product Data, Drawings, and Schematics for the equipment systems.
  - 3. Theory of Operation: Description of technical operating characteristics of the system and individual equipment using standard phraseology; descriptions of interface requirements

including operating protocols; equipment displays and screens; make reference to installation drawings, schematics and equipment displays as required for technical understanding.

**D. Identification Legends:**

1. Piping and equipment: Provide a computer-generated legend to correspond with identification devices installed on piping and equipment. List the identifying device, its location, a brief description of the devices function, and the I.D. number.
2. Panel boards and switchboards: Provide a computer-generated legend for each panel board and switchboard installed in the project. This information shall be a duplicate of the legend placed in the panel board.
3. Valve Tags and Schedule: Provide a computer-generated schedule of all valve tags. Include valve type, manufacturer, equipment location and size for all newly installed valves.

**E. Organize the manual into separate Sections, by system as described in Paragraph "O&M Manual Sections By Building System" of this Article, for each system or piece of related equipment.**

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:
  - a. Subject matter covered by the manual
  - b. Name and address of the Project
  - c. Date of submittal
  - d. Name, address, and telephone number of the Contractor
  - e. Name and address of the Architect
  - f. Cross-reference to related systems in other operation and maintenance manuals.
  - g. Name, address and telephone number of all sub-contractors.
2. Table of Contents: After the title page, include a computer-generated table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product incorporated, identified by product name and other appropriate identifying symbol and indexed to the content of the volume. Each Data Package shall be tabbed and separately listed in the Table of Contents. Where multiple volumes are required to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.
3. General Information: Provide a general information Section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or installer and the maintenance contractor where applicable. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.
4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one item in a tabular format, identify each item, using appropriate references from the

Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.

5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data are not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.
6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to ensure correct illustration of the completed installation.
7. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract tabbed in a separate binder. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect the validity of a warranty or bond.

- F. O&M Manual Sections by Building System. This is the format to follow when preparing the Table of Contents.

BUILDING SYSTEM
Plumbing Systems
HVAC Systems
Building Management & Control Systems
Fire Alarm
Fire Suppression
Electrical Systems

## PART 2 – PRODUCTS (NOT USED)

## PART 3 – EXECUTION

### 3.1 SCHEDULE

- A. Schedule of Operation and Maintenance Data Packages. The following is a minimum of information required for Operation and Maintenance Manuals for this project. Refer to individual technical Section for any additional information, which may be specified for O&M Manuals.

Schedule of Operation and Maintenance Data Packages					
		DP 1	DP 2	DP 3	DP 4
07210	Building Insulation				
07220	Roof Insulation				
07251	Spray-on Fireproofing				

**SEATTLE ARTCC - AUTOMATION WING REHABILITATION  
(SECOND FLOOR AND ATTIC)**

**July 2009**

Schedule of Operation and Maintenance Data Packages					
		DP 1	DP 2	DP 3	DP 4
07270	Fire Stopping	X			
07545	Thermoplastic Single-Ply Roofing (TPO)		X		
07600	Flashing and Sheet Metal	X			
07720	Roof Accessories		X		
07920	Joint Sealants	X			
08110	Standard Steel Doors and Frames	X			
08305	Access Doors	X			
08510	Exterior Aluminum Windows		X		
08710	Door Hardware	X			
08830	Mirror Glass	X			
09255	Gypsum Board Assemblies				
09263	Gypsum Board Shaft-Wall Assemblies				
09300	Ceramic Tile	X			
09511	Acoustical Panel Ceilings	X			
09660	Resilient Tile Flooring	X			
09678	Resilient Wall Base	X			
09680	Carpet	X			
09800	Special Coatings	X			
09900	Paints	X			
10100	Visual Display Boards	X			
10155	Toilet Compartments	X			
10200	Louvers	X			
10265	Wall Surface Protection Systems	X			
10522	Fire Extinguishers, Cabinets and Accessories	X			
10750	Telephone Specialties	X			
10800	Toilet and Bath Accessories	X			
13850	Fire Alarm System				X
15050	Basic Mechanical Materials	X			
15070	Mechanical Vibration and Seismic Controls	X			
15100	Valves		X		
15125	Pipe Expansion Joints	X			
15135	Meters and Gages		X		
15145	Hangers and Supports	X			
15170	Motors				X
15171	Variable Frequency Drives				X
15180	Hydronic Piping	X			
15185	Hydronic Pumps	X			
15190	Mechanical Identification	X			
15250	Mechanical Insulation	X			
15325	Automatic On/Off Fire Sprinkler System				X
15410	Plumbing Piping	X			
15430	Plumbing Specialties	X			
15440	Plumbing Fixtures		X		
15810	Humidifiers			X	

**SEATTLE ARTCC - AUTOMATION WING REHABILITATION  
(SECOND FLOOR AND ATTIC)**

**July 2009**

Schedule of Operation and Maintenance Data Packages					
		DP 1	DP 2	DP 3	DP 4
15850	Air Handling			X	
15854	Central Station Air Handling Units				X
15886	Air Filters	X			
15891	Metal Duct	X			
15910	Duct Accessories (except smoke, fire/smoke dampers)	X			
15932	Air Outlets and Inlets		X		
15933	Air Terminals			X	
15965	Leak Detection				X
15975	Control Systems – Electronic and Direct Digital				X
15990	Testing, Adjusting and Balancing				X*
16050	Basic Electrical Materials and Methods				
16100	Raceways, Boxes and Cabinets	X			
16120	Wires and Cables	X			
16140	Wiring Devices	X			
16190	Supporting Devices	X			
16195	Electrical Identification	X			
16452	Grounding		X		
16470	Panelboards		X		
16476	Disconnects and Enclosed Circuit Breakers		X		
16481	Motor Controllers			X	
16515	Interior Lighting	X			
16670	Lightning Protection			X	
16770	Public Address System			X	

\* Provide Plan and Report

END OF SECTION 01782

Attachment 1: FAA Equipment Systems and Sub-Systems						
System ID		System Name		Sub-System ID		Sub-System Name
CONTROL		Control System		CCMS		Central Control & Monitoring System
				DDC		Direct Digital Control System
CONV		Conveying Systems		LLS		Lifting/Lowering System
ELECT		Electrical System		ELECT		Electrical System Description, General
				LIGHTING		Lighting Fixtures
				PCS		Power System Monitoring & Control
				SD		Service & Distribution System
				UPS		Uninterruptible Power System
FIRE		Fire Alarm and Protection System		FAS		Fire Alarm and Detection System
				FPS		Fire Protection System
FUEL		Fuel Oil System		FUEL		Fuel Oil System
GROUND		Roads and Grounds		GROUND		Grounds
HVAC		Heating, Ventilation, and Air Conditioning System		ADS		Air Distribution System
				COND		Condenser Water System

Attachment 1: FAA Equipment Systems and Sub-Systems						
System ID		System Name		Sub-System ID		Sub-System Name
HVAC				CWS		Chilled Water System
				HWS		Heating Hot Water System
				IAS		Instrument Air System
				STEAM		Steam/ Humidification System
KITCH		Kitchen Equipment		KITCH		Kitchen Equipment
MISC		Miscellaneous Systems and Equipment		MISC		Miscellaneous System & Equipment
PLUMB		Plumbing System		SAN		Sanitary System
				WSS		Water Supply System
SECURITY		Security System		SECURITY		Security System

Attachment 2: Format for O&M Inventory Information

Attachment 2: Format for O&M Inventory Information									
Equipment Identification	Description	Room	Manufacturer	Vendor	Model	Serial Number	System I.D.	Sub-System I.D.	Notes



## SECTION 01810

### GENERAL COMMISSIONING REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. Commissioning is a team-oriented, systematic process to verify, and document performance of selected facility systems, and assemblies, in accordance with defined objectives, criteria, the Operational Performance Requirements, and the Basis of Design.
- C. The Commissioning Process is a quality based method that is adopted by the Owner to achieve a successful construction project and is not an additional layer of construction or project management. Commissioning does not remove or reduce the responsibility of the contractor or it's subcontractors to provide a finished and fully functional product.
- D. Refer to the Commissioning Plan for specifics regarding the Commissioning Process and procedures, systems and equipment to be commissioned, and roles and responsibilities for all Commissioning Team members. The Commissioning Plan is part of the contract documents. The Commissioning Plan is a working document and is updated as additional information concerning systems to be commissioned is obtained. As checklists and test documents are developed, updated and completed; each become a part of the Commissioning Plan.
- E. Related Divisions and Sections:
  - 1. Division 1, Section 01330, "Submittal Procedures"
  - 2. Division 1, Section 01782, "Operation and Maintenance Manual Data"
  - 3. Division 1, Section 01820, "Demonstration and Training"
  - 4. Division 15, "Mechanical"

##### 1.2 REFERENCES

###### ASHRAE

- 1. The Commissioning Process, Guideline 0-2005

##### 1.3 DEFINITIONS

- A. Acceptance: A formal action, taken by a person with appropriate authority (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.

- B. Basis of Design, (BoD): A document that records the concepts, calculations, decisions, and product selections used to meet the Operational Performance Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- C. Checklists: Verification checklists that are developed and used during all phases of the commissioning process to verify that the OPR and BoD are being achieved. This includes checklists for general verification, testing and other specific requirements.
- D. Commissioning: A systematic process of ensuring that equipment or systems have been properly installed and function in tested modes according to Contract Documents. It shall also verify that building systems perform interactively according to Basis of Design and FAA's operational needs. The Commissioning process shall encompass and coordinate traditionally separate functions of system documentation, equipment Startup, Control System calibration, testing and balancing and performance testing.
- E. Commissioning Agent, (CxA): Identified by the owner. Leads, plans, schedules and coordinates the commissioning team to implement the Commissioning Process. The process is based on the structure developed and presented in ASHRAE Guideline 0-2005.
- F. Commissioning Plan: A written plan of how the commissioning process will be accomplished. The plan describes how the Design Manager (DM), Resident Engineer (RE), CxA, General Contractor (GC) and Subcontractors will accomplish commissioning responsibilities.
- G. Commissioning Process: A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and its systems and assemblies are planned, designed, installed and tested to meet the OPR.
- H. Commissioning Team: The individuals who through coordinated actions are responsible for implementing the commissioning process.
- I. Construction Verification Checklist: Activities that must be performed for the proper storage, handling and installation of building components and equipment. Construction verification checklists must be completed by the GC prior to Functional Performance Testing.
- J. Construction Documents: These include a wide range of documents that will vary from project to project and with the Owner's needs and with regulations, and laws. Construction Documents usually include the project manual (specifications), plans (drawings), and general terms and conditions of the contract.
- K. Contract Documents: These include a wide range of documents that will vary from project to project with the Owner's needs, regulations, and laws. Contract Documents frequently include price agreements, construction management process, subcontractor agreements, and/or requirements, requirements and procedures for submittals, changes, other construction requirements, timeline for completion, and the Construction Documents.
- L. Coordination Drawings: Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.

- M. Deficiency: An issue that prohibits the successful passing of any step in the installation or function of a component, piece of equipment, or system that is not in compliance with OPR, BoD, or contract documents.
- N. Factory Testing: Testing of equipment at the factory or on-site by a factory representative with Design Manager, Resident Engineer or other FAA representative present.
- O. Functional Performance Tests (FPT): A procedure authored by the CxA designed to verify the functional performance of equipment or systems under a full range of operating conditions and loads, as specified by contract documents. The contractor and/or subcontractors perform the FPT's and provide necessary test equipment to complete the test. The CxA directs, witnesses, and documents the FPT's.
  - 1. Functional performance testing shall not be performed until Construction Verification Checklists and Startups are completed, and verified.
- P. General Contractor (GC): The contractor and subcontractor, suppliers and vendors who perform the construction activities and comply with the contract documents.
- Q. Issues Log: A formal and ongoing vehicle to track commissioning issues concerns, deficiencies, their status and resolution of each item.
- R. Occupancy and Operations Phase Cx: May include tests performed after Substantial Completion, due to partial occupancy, equipment, seasonal and/or design requirements, or other site conditions that prohibit tests from being performed. During construction phase, may also include, seasonal tests, problem resolution, design evaluation, site visits, updated drawings and specifications, or other requirements performed during the occupancy and initial operations period defined for the project.
- S. Operational Performance Requirements, (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. The OPR is translated into the construction documents. The OPR is the ultimate measure of the project's technical success.
- T. Owner's Witness: Owner authorized witness designated to sign completed Commissioning Test Data Forms to authenticate reported test data.
- U. Seasonal Performance Tests: Functional Performance testing deferred until the system will experience conditions closer to design conditions.
- V. Simulated Condition: Condition created for purpose of testing response of system.
- W. Startup: Initial starting or activating of dynamic equipment, including executing Construction Verification Checklists. Startup must be completed prior to Functional Performance Testing.
- X. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

- Y. Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.
- Z. Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the OPR and BoD.

#### **1.4 COMMISSIONING TEAM**

- A. Members of the commissioning team shall include the following and their representatives:
  - 1. FAA Design Manager (DM)
  - 2. FAA Resident Engineer (RE)
  - 3. Commissioning Agent (CxA)
  - 4. General Contractor (GC)
- B. Membership: Team members shall be appointed, each having the authority to act on behalf of the entity he or she represents, to implement the commissioning process through coordinated action.

#### **1.5 OWNER'S RESPONSIBILITIES**

- A. The Owner defines the overall vision for the use of the area, establishes the Operational Performance Requirements (OPR) and Commissioning objectives, appoints the Resident Engineer, establishes the construction budget, and ultimately accepts and operates the finished facility.
- B. The FAA appoints the Resident Engineer (RE) as the FAA's contracting officer's technical representative. The RE is the primary day-to-day FAA point of contact. The RE is responsible to ensure work is completed in accordance with the contract document requirements and that the FAA's design intent is met upon completion. The RE is the single point of contact for coordinating work with the FAA operations and accepting submittals, deliverables and completed work.

The RE Responsibilities include:

- 1. Assembles the Commissioning Team (CxT).
- 2. Attends design, construction, and commissioning related meetings.
- 3. Coordinates site visits and testing with the CxA.
- 4. Monitors/reviews CVC's to ensure the results are documented as the checklists are completed.
- 5. Monitors controls point-to-point checks performed by the controls contractor and ensure the results are documented as the checks are completed.
- 6. Oversees all or part of testing of the control system and approves it for use by TAB, before TAB is executed.
- 7. Receives TAB plans and reports. Coordinates their review.
- 8. Participates at their discretion in Functional Performance Testing.

9. Coordinates training with the maintenance staff and the General Contractor and approves training plans.
  10. Coordinates submission and review of the Operations and Maintenance documentation and approves Operations and Maintenance documentation.
  11. Reviews and approves GC maintenance schedules for equipment operated by the GC prior to acceptance.
  12. Review and approve the preparation of the final O&M manuals. Ensure required O&M manuals, instructions and demonstrations are provided to the FAA's designated operating staff.
  13. Review equipment warranties to ensure that the FAA's responsibilities are clearly defined.
- C. Appoints the Design Manager (DM). The DM has the overall responsibility to execute the design in accordance with the OPR.

The DM shall:

1. Translates the FAA's requirement into technical design intent.
2. Prepares thorough, accurate, and clear contract documents.
3. Develops/updates the Operational Performance Requirements (OPR).
4. Incorporates commissioning specifications and related information into construction specifications.
5. Supports and advises the Commissioning Authority (CxA) in developing testing documents.
6. Issues clarifications or interpretations of Design Intent as required.
7. Provides the CxA one copy of all approved technical submittals.
8. Provides the CxA one copy of correspondence regarding all RFI's.
9. Consults and resolves any design related issues/problems that arise during the construction.
10. Copies the CxA on changes relating to systems and equipment to be commissioned.

#### 1.6 COMMISSIONING AGENT (CxA) RESPONSIBILITIES

- A. The CxA implements and facilitates overall Commissioning activities. The primary role of the CxA is to develop, coordinate and execute testing plans, document performance and confirm proper system functionality and interactions in accordance with the OPR, BoD, and Contract Documents.
- B. The CxA functions interdependently with the design and construction teams and is the FAA's representative throughout the construction process.
- C. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. These are responsibilities of the FAA, Design Manager, and General Contractor.
- D. The CxA shall assist with problem solving, and resolving non-conformance or deficiency issues; however, responsibility remains that of the designer and contractor.
- E. Specific responsibilities of the Commissioning Agent include:

1. Develops a Commissioning Plan, which describes in general the extent of the HVAC Commissioning process to accomplish the design intent and coordinate with the construction schedule.
2. Coordinates Commissioning activities in a logical, sequential and efficient manner.
3. Kicks off the commissioning effort. Conducts an initial CxT meeting to describe the process, review roles and responsibilities, set expectations, establish communication and coordinate the work.
4. Schedule and lead commissioning meetings as needed with the Commissioning Team.
5. Develops Construction Verification Checklists (CVCs) and Functional Performance Tests (FPTs) based on the Contract Documents, manufacturers O&M information, and accessibility requirements for O&M. Brings to the attention of the DM, GC, and RE identified deficiencies and coordination problems with HVAC systems/equipment to be commissioned.
6. Reviews completed CVCs to ensure the results are documented properly as the checklists are completed and to evaluate any issues which are documented in the CVCs.
7. Tracks testing non-conformance. Participates in re-testing as necessary until satisfactory performance is achieved as requested by the FAA.
8. Compile and maintain organized and complete commissioning records.
9. Review approved submittals applicable to the systems being commissioned to assist in development of testing checklists.
10. Review requests for information and change orders for impact on commissioning.
11. Establishes test plans and cooperates with schedules set up by CxT.
12. Coordinate with the RE & GC to monitor Functional Performance Testing for commissioned systems and assemblies. Witness and document Functional Performance Tests performed by the Contractor for all commissioned HVAC systems and assemblies.
13. The Functional Performance Testing will include operating the system and components through each of the written sequences of operation, and other significant modes and sequences, including start-up, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure and interlocks with other systems or equipment. Sensors and actuators shall be calibrated by the installing contractors, and spot-checked by the commissioning provider during Functional Performance Testing. Coordinate retesting as necessary until satisfactory performance is achieved. Tests on respective HVAC equipment shall be executed, if possible, during both the heating and cooling seasons. However, some overwriting of control values to simulate conditions may be required. Functional Performance Testing shall be done using conventional manual methods and readouts, to provide a high level of confidence in proper system function, as deemed appropriate by the FAA.
14. Maintain a master issues log and a separate record of Functional Performance Testing. Report all issues to the RE as they occur. Provide written progress reports and test results with recommended actions.
15. If requested by the CxT attend selected planning and job-site meetings to obtain information on construction progress.
16. Reviews TAB execution plan and reports.
17. As a part of the FPTs, monitors control point-to-point checks performed by the controls contractor and ensures the results are documented as the checks are completed.
18. Reviews FPTs and analyze data to verify performance.
19. Document design non-compliance and deficiencies identified in all phases of Commissioning.
20. Recommends acceptance of tested systems and equipment commissioned to the RE.
21. Provides a final Commissioning Report that will include:



- a. An Executive Summary
- b. List of participants and roles
- c. Brief project description
- d. Overview of Commissioning and testing scope
- e. General description of testing and verification methods.
- f. For each piece of commissioned HVAC equipment, the report will contain the disposition of the Commissioning Authority regarding the adequacy of the equipment. Outstanding non-compliance and deficiencies shall be specifically listed. Appendices shall contain acquired documentation of all completed CVCs, FPTs, deficiency lists, site visit reports, general findings and unresolved issues.

**1.7 CONSTRUCTION GENERAL CONTRACTOR (GC) RESPONSIBILITIES.**

- A. The GC has overall responsibility and authority to procure the construction materials and work force and manage the construction to ensure compliance with and coordination of the Contract Documents.
- B. Specific responsibilities of the GC include:
  1. Include cost of support for the Commissioning process in the total Contract Sum.
  2. Cooperate with the CxA and other Commissioning Team members, to facilitate the successful completion of the Commissioning process.
  3. Facilitate coordination of Commissioning by Commissioning Agent and shall include Commissioning activities in Construction Schedule.
  4. Assign a GC representative to the Commissioning Team within one month of the Award of the Contract. The representative shall have the authority to make decisions on behalf of the GC as those decisions relate to the organization and scheduling of Commissioning activities.
  5. Coordinate construction meetings, schedules and Commissioning activities with the RE and CxA. Coordination shall include, but not be limited to the following:
    - a. Commissioning Team meetings
    - b. Planning
    - c. Scheduling Documentation
    - d. Provide the CxA with pertinent information (RFI, submittals, changes) relative to systems and equipment to be commissioned.
  6. Attend Commissioning Team meetings, respond to action items from these meetings to allow the Commissioning activities to proceed on schedule.
  7. Ensure cooperation and participation of specialty sub-contractors.
  8. Submit Commissioning milestones for incorporation into the overall construction schedule, in cooperation with the CxA and FAA. As a minimum, the following commissioning related activities shall be included in the project schedule:
    - a. Completed installation of systems and assemblies to be commissioned.
    - b. Completed Construction Verification Checklists.
    - c. Functional Performance Testing.
    - d. Training sessions.
    - e. Substantial completions.

9. Inspect, check and confirm the correct and complete installation of all systems, sub-systems and component start-up for each system. Coordinate with all trades to document the results of inspections on the checklists and sign them. If deficient or incomplete work is discovered, ensure corrective action is taken and re-check until the results are satisfactory and the system is ready for safe start-up.
10. Notify the RE seven (7) days in advance of scheduled on-site start-up or equipment energization procedures.
11. Assist and operate equipment during systems testing as required.
12. Provide any special tools and/or instruments specific to the piece of equipment or system that is required for testing. Test instruments shall have verifiable certificate of calibration within the past twelve (12) months.
13. Provide O&M documentation in accordance with the construction specifications.
14. Develop and execute orientation and training in accordance with the contract documents.
15. Provide personnel to assist the CxA during system verification and FPTs. Operate equipment and systems during FPTs in accordance with the Commissioning Plan and as directed by the CxA. If improper functionality, incomplete work, or other deficiencies affecting system performance are discovered, the CxA will stop the FPTs. Those responsible for deficient or incomplete work will be equally responsible to ensure necessary corrections are completed for full system operation as specified.
16. In the event the deficiencies cannot be completed within one (1) re-test, the GC shall pay the cost to retest plus any additional cost incurred for travel expenses for subsequent tests.
17. Execute Commissioning responsibilities according to Contract Documents and Construction Schedule.
18. Attend Commissioning meetings.
19. Coordinate training of FAA personnel.
20. Complete Construction Verification Checklists (CVCs) and submit them to RE. CVCs shall be completed as the equipment delivery, installation and start up progresses. CVCs shall be complete and verified before functional testing is performed.
21. Analyze functional performance trend logs and monitoring data to verify performance of installed equipment.
22. Provide requested Submittal data, including detailed start-up procedures and specific responsibilities of the FAA required to keep warranties in force.
23. Provide information requested by Commissioning Agent regarding equipment sequence of operation and testing procedures.
24. Coordinate Test Procedures for equipment installed by factory representatives with the Commissioning Agent or RE.
25. Comply with the Commissioning Plan.
26. Provide approved equipment documentation to Commissioning Agent, including detailed start-up procedures.
27. Execute Seasonal Functional Performance Testing, if needed, in accordance with specifications and within the Warranty Phase.

## 1.8 COORDINATION

- A. Management: Commissioning Agent directs and coordinates Commissioning activities.



1. Members of Commissioning Team work together to fulfill their contracted responsibilities and meeting objectives of Contract Documents. The CxA facilitates the commissioning process.
2. Commissioning shall be coordinated with construction and acceptance.

**B. Scheduling:**

1. GC shall work with the RE and CxA in accordance with requirements of Contract Documents to schedule Commissioning activities.
2. GC shall provide sufficient notice to the RE and CxA for scheduling Commissioning activities. The GC shall integrate Commissioning activities into the Construction Schedule.
3. Commissioning Team and others involved in Commissioning process shall address scheduling problems and make necessary notifications in a timely manner in order to expedite Commissioning process.
4. The GC shall coordinate with the RE and CxA. Coordination shall include the following:
  - a. Site visits and meetings
  - b. Planning
  - c. Scheduling
  - d. Documentation
  - e. Communication with the CxA
  - f. Corrective actions

**1.9 SUBMITTALS**

- A. Commissioning Plan.** The CxA develops the Commissioning Plan to guide the commissioning process.
1. General project information.
  2. Key points of contact.
  3. Roles and responsibilities.
  4. List of systems to be commissioned.
  5. Scope Construction Verification Checklists.
  6. Deficiency/non-conformance tracking format.
- B. Commissioning Tests and Checklists:** The CxA develops provides Checklists to the commissioning team. Checklists will be developed utilizing the contract documents and approved submittals:
1. Construction Verification Checks (CVC): Construction Verification Checklists cover the activities that must be performed for the proper storage, handling and installation of building components and equipment. CVCs shall be completed and submitted prior to startup.
  2. Functional Performance Test (FPT): Functional Performance Tests cover activities associated with starting and running dynamic equipment and systems to insure proper set-up, alignment, operation and that inputs/outputs are in accordance with the design. For non-dynamic components, functional tests ensure proper function.

**1.10 COMMISSIONING PROCESS**

- A. The Commissioning Plan is a working document and will be updated as the various checks and tests are completed and additional information concerning the systems to be commissioned are obtained.
- B. Commissioning Process. The following are anticipated commissioning tasks:
  - 1. Commissioning checklists and the equipment list will be developed and provided as specific manufacturers and models of equipment are submitted and approved for installation.
  - 2. Specific checks and tests will be performed and documented on checklists for the CVC's and FPTs. The GC shall document by initialing the specific checks on each individual CVC. The RE and CxA will spot check for compliance.
  - 3. The CxA will update the commissioning plan to incorporate changes in key personnel, construction modifications, schedule changes and other events that may affect the commissioning process.
  - 4. A commissioning kick off meeting will be conducted by the CxA, to review the commissioning process with the commissioning team members.
  - 5. Additional meetings shall be required throughout construction, scheduled by the RE and CxA with necessary parties attending, to plan scope, coordinate, schedule future activities and resolve problems. The CxA will participate in these meetings by phone.
  - 6. Approved equipment documentation is provided to the CxA upon completion of formal submittal review, including detailed manufacturer's installation and startup procedures.
  - 7. The GC shall provide manufacturer's O&M, installation and startup directions to the RE for incorporation into the process.
  - 8. The GC executes the Construction Verification Checklists and completes according to the Commissioning Plan, and documents results. The RE will witness startup of selected and critical equipment, as identified by the FAA.
  - 9. The CxA develops required specific equipment and system functional performance test procedures.
  - 10. The CxA oversees the FPTs. The GC shall execute the tests and sign-off on these tests.
  - 11. Items of non-compliance are noted and logged in the issues log. Corrective action by the appropriate party is noted and logged.
  - 12. The RE reviews and verifies training plans developed and executed by the GC and Subcontractors.
  - 13. The RE reviews the Operation and Maintenance Manual documentation.
- C. The GC shall verify each item of each commissioning checklist has been checked. Non-compliance issues shall be noted on an issues log developed and provided by the CxA.
- D. Various Sections of the Specifications include commissioning requirements. These requirements shall be included in the Commissioning Process, but shall not be interpreted to be the only commissioning requirements. The Commissioning Specification, tests and checklists shall take precedence, where there are conflicts.
- E. Completed checklists and deficiency/non-conformance reports shall be turned in to the RE at the completion of each check or test.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 STARTUP, CONSTRUCTION VERIFICATION CHECKLISTS, AND INITIAL CHECKOUT**

- A. General: Construction Verification Checklists are used to check that equipment and systems are properly connected and operational. Every piece of commissioned equipment shall receive construction verification checkout by the GC. Construction verification checks for a given system shall be successfully completed prior to Functional Performance Testing.
  - 1. Only individuals who have direct knowledge and who witnessed that the line item task on the construction verification checklist was performed shall initial or check the item off the performance checklist.
  - 2. Construction verification checks shall be performed concurrent with component delivery, storage, installation and start-up. Checks shall not be postponed to the last stages of component installation.

**3.2 FUNCTIONAL PERFORMANCE TESTING**

- A. General:
  - 1. The following applies to all Commissioning functional testing required for Project.
  - 2. List of equipment to be commissioned is found in the commissioning plan.
- B. Test Methods:
  - 1. Functional Performance Testing and verification may be achieved by Manual Testing and/or by monitoring performance and analyzing results using Control System's trend log capabilities or by stand-alone dataloggers.
    - a. The Commissioning Plan and the Specifications describe methods to be used for each test.
      - 1) Commissioning Agent may substitute specified methods or require additional methods to be executed, with approval of the FAA.
      - 2) Commissioning Agent shall determine which method is most appropriate for tests that do not have method specified.
  - 2. Simulated Conditions: Allowed with CxA approval, however, schedule the testing to experience actual conditions wherever practical.
    - a. Before simulating conditions, sensors, transducers, and devices shall be calibrated.
  - 3. Over-Written Values:

- a. Allowed with RE and CxA approval, but shall be used with caution and avoided when possible.
  - b. Before overwriting values, sensors, transducers, and devices shall have been calibrated.
- 4. Altering Setpoints: Acceptable procedure in lieu of overwriting sensor values or simulating conditions, with RE and CxA approval.
- 5. Setup:
  - a. Each function and test shall be performed under conditions that simulate actual conditions as close as practically possible.
  - b. The GC shall provide necessary materials, system modifications, etc., to produce necessary flows, pressures, temperatures, etc., necessary to execute test according to specified conditions.
  - c. At completion of test, the GC shall return affected building equipment and systems to pre-test condition.
- 6. Sampling:
  - a. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a Sampling strategy developed by the CxA.
  - b. Significant application differences and significant sequence of operation differences in otherwise identical equipment will be deemed to invalidate the common identity of the equipment.
  - c. Small size or capacity difference, alone, does not constitute a difference in the equipment.
  - d. Specific recommended sampling rates are identified in the Commissioning Plan.
    - 1) If, at any point, frequent failures occur and testing becomes more troubleshooting than verification, the Commissioning Agent may stop testing and require the GC to perform and document checkout of remaining units, prior to continuing with functional testing of the remaining units.
  - e. Sampling is not allowed in Construction Verification Checklist execution.
- C. Coordination and Scheduling:
  - 1. The GC shall provide sufficient notice, as specified elsewhere in this Specification Section, to Commissioning Agent regarding completion schedule for Construction Verification Checklists and Startup of equipment and systems. Schedule functional tests through the FAA RE.
    - a. Functional testing shall be executed by the GC.
    - b. The Commissioning Agent shall direct, witness, and document functional testing.
  - 2. General:
    - a. Functional testing shall be conducted only after construction verification checks and Startup has been satisfactorily completed.

- b. Control System shall be sufficiently tested and approved by the RE prior to use for testing and balancing or to verify performance of other components or systems.
  - c. Air balancing and water balancing shall be satisfactorily completed before functional testing of air-related or water-related equipment or systems.
  - d. Testing shall proceed from components or subsystems to systems.
  - e. When proper performance of interacting individual systems has been achieved, interface or coordinated responses between systems shall be checked.
- D. Problem Solving: Commissioning Agent may participate in problem solving, however, the burden of responsibility to solve, correct, and retest problems remains with the GC and the RE.
  - 1. Cost of Retesting:
    - a. Deficiencies for which GC is responsible, the GC is responsible for costs.
    - b. Government cost for more than one (1) retest in which the GC is responsible shall be reimbursed by the GC.
    - c. The Commissioning Agent will track re-testing as an open item in the Commissioning Issues Log.
    - d. Required retesting by GC shall not be considered justification for Claim of Delay or for time extension by GC.

### 3.3 OPERATION AND MAINTENANCE MANUALS

- A. Specific content and format requirements for standard Operation and Maintenance Manuals are detailed in Section 01782 and in the pertinent sections of technical Specifications.

### 3.4 TRAINING OF OWNER'S PERSONNEL

- A. Specific content and format requirements for Demonstration and Training are detailed in Section 01820 and in the pertinent sections of technical Specifications.

### 3.5 DEFERRED TESTING

- A. Seasonal Performance Testing: Seasonal Performance Testing specified in other sections shall be completed as part of this Contract. RE shall coordinate Seasonal Performance Testing. Tests shall be executed, documented, and deficiencies corrected by appropriate subcontractors, with facilities staff and Commissioning Agent witnessing. Make final adjustments to Operation and Maintenance Manuals and Record Documents due to Seasonal Performance Testing.

END OF SECTION 01810



## VAV- - Functional Performance Tests

Task No.	Task Description	Contractor	Checked	Ok	Deficiency Comment #
<b>1</b>	<b>Basic Installation Functional Verification Checklist</b>				
1.1	Verify start-up and pre-functional testing of VAV Box VAV-_____ and associated components have been completed. Record VAV Box commissioning date. _____	CC			
1.2	Verify the Building Automation System (BAS) is operational. This includes confirming that communications with the existing building Direct Digital Controllers (DDC) and Operator Work Station (OWS) is operational; that the BAS has been programmed, powered up, and all sensor/end device connections have been completed; and the graphic screens have been installed on the OWS.	CC			
1.3	Verify control components (sensors, valves, and dampers etc.) are the correct series, model, type, capacity, configuration and options are as specified in submittal and contract documents.	CC			
<b>1.4</b>	<b>Confirm Sensor/End Device Functionality - Confirm points included in the control system design have been provided, are connected to the correct sensor or end device, and are reading/operating correctly. Confirm that valves stroke fully open and closed and that dampers open completely and close completely.</b>				
1.4.1	Space Temperature	CC			
1.4.2	Air Flow	CC			
1.4.3	Damper Control	CC			
1.4.4	Heating Hot Water Valve Control	CC			
<b>2</b>	<b>Function Performance Testing - Simulate the Sequences of Operation: Confirm the control functionality, described in each statement below, occurs. When a control function does not respond as described in the statement, record the deficiency.</b>				
<b>2.1</b>	<b>Through the BAS, stop the associated air handling unit. (Assumes that the air handling unit is operating at the beginning of testing.)</b>				
2.1.2	Once the AHU's supply fan status point indicates that the unit is off, Does the VAV Box damper close?	CC			
2.1.3	Does the VAV Box heating hot water valve close? (yes/no)	CC			
<b>2.2</b>	<b>Through the BAS, start the associated air handling unit.</b>				
2.2.1	Once the AHU's supply fan status point indicates that the unit is on, does the VAV box controller begin to modulate the VAV box damper and heating hot water valve to maintain the space temperature at set point?	CC			
<b>2.3</b>	<b>VAV Box Space Temperature Control (Cooling Set Point 75°F; Heating Set Point 68°F)</b>				
2.3.1	Override the space temperature and input a value of 78°F. Does the VAV box damper modulate open to the maximum air flow position? Record monitored air flow and compare to scheduled maximum air flow. Scheduled Air Flow: _____ CFM; Actual Air Flow: _____ CFM	CC			
2.3.2	Does the heating hot water valve close?	CC			
2.3.3	Input a space temperature value of 70°F. Does the VAV box damper modulate to the minimum air flow position? Record monitored air flow and compare to scheduled minimum air flow. Scheduled Air Flow: _____ CFM; Actual Air Flow: _____ CFM	CC			
2.3.4	Does the heating hot water valve remain closed?	CC			



## VAV- - Functional Performance Tests

Task No.	Task Description	Contractor	Checked	Ok	Deficiency Comment #
2.3.5	Input a space temperature value of 64°F. Does the VAV box damper modulate open to provide 75% of the scheduled maximum air flow? Record monitored air flow and compare to 75% of scheduled maximum air flow. 75% Scheduled Air Flow: _____ CFM; Actual Air Flow: _____ CFM	CC			
2.3.6	Does the heating hot water valve modulate open?	CC			
2.3.7	Input a space temperature value of 66°F. Does the heating hot water valve begin to modulate towards the closed position while the VAV box damper modulates towards the minimum air flow position?	CC			
2.3.8	Input a space temperature value of 70°F. Does the VAV box damper modulate to the minimum air flow position?	CC			
2.3.9	Does the heating hot water valve close?	CC			
2.3.10	Input a space temperature value of 74°F. Does the VAV box damper begin to modulate to the maximum air flow position?	CC			
2.3.11	Does the heating hot water valve remain closed?	CC			
2.3.12	Place all control functions and points back into automatic operation and return set points to design settings. Does the VAV box return to normal operation?	CC			
<b>3</b>	<b>Failure Condition Testing - Simulates loss of control signal from the VAV box controller and loss of power to the VAV box controller.</b>				
<b>3.1</b>	<b>With the VAV box in operation, turn off power to the VAV box controller.</b>				
3.1.1	Did the VAV box damper fail to it's last commanded state?	CC			
3.1.2	Did the hot water valve open?	CC			
<b>3.2</b>	<b>Restore power to the VAV box controller.</b>				
3.2.1	Confirm that the VAV box controller restarts and that automatic control functions return to normal. (yes/no)	CC			
<b>Deficiency Record</b>					
1					
2					
3					
4					
5					
6					
<b>Other Deficiencies Noted but not Directly Associated with the FPT</b>					
M1					
M2					
	<b>Testing plan has been signed by parties having direct knowledge of the event. Completion of functional performance testing does not indicate acceptance or responsibility by the FAA.</b>				
	Temperature Controls Contractor - Signature and Date:				
	Mechanical Contractor - Signature and Date:				
	Commissioning Agent - Signature and Date:				
	Resident Engineer - Signature and Date:				



# AHU CC, HC, OA& VFD, 3 Phase, AHU-\_\_\_\_

## Construction Verification Checklist



1100 North Glebe Road, Suite 500  
Arlington, VA 22201  
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Fax: (571) 218-1600

FAA - ZSE Air Route Traffic Control Center  
AWR2 Project - Seattle, Washington

Task No.	Task Description	Contractor	Contractor Initial and Date
<b>1</b>	<b>Equipment Delivery and Acceptance Verifications</b>		
1.1	<b>Note:</b> Record actual Name Plate Data and confirm unit is as specified in the contract documents: Manufacturer: _____ Model Number: _____ Serial Number: _____ Volts/Phase/Hz: _____ CFM: _____; Cooling BTUH: _____; Heating BTUH: _____ Motor FLA: _____ Amps; Motor HP: _____ Cooling Coil Flow Rate: _____ GPM; Heating Coil Flow Rate: _____ GPM	MC	
1.2	Verify AHU configuration is as specified in the contract documents.	MC	
1.3	Verify date of manufacture. (Verify by date tag or serial number. If date exceeds 16 weeks notify RE and CxA).	MC	
1.4	Verify unit is free of physical damage (dents, holes, etc.).	MC	
1.5	Verify unit is stored on a flat surface in a safe and dry environment.	MC	
1.6	Verify packing list has been checked and non mounted parts inventoried and confirmed.	MC	
<b>2</b>	<b>Basic Installation</b>		
2.1	Verify unit is installed in the proper location per the contract documents.	MC	
2.2	Verify shipping blocks and brackets, etc. have been removed.	MC	
2.3	Verify concrete pad is in good condition and is of sufficient height to allow for proper drainage of condensation.	MC	
2.4	Verify sufficient access and clearance has been provided to and around equipment for servicing. (Access is defined as sufficient space for a middle aged man of average size and health to be able to perform necessary maintenance and repairs.)	MC	
2.5	Verify there is sufficient space on one side of the unit equal to the width of the AHU for removal of the coils and fan assemblies.	MC	
2.6	Verify sufficient space clearance has been provided for the electrical power and control access points and that minimum clearances have been provided per electric code.	MC	
2.7	Verify the unit is level.	MC	
2.8	Verify that vibration and sound isolation equipment is installed per contract documents.	MC	
2.9	Verify all sensor locations are appropriate and away from causes of erratic operation.	MC	
2.10	Verify the following dampers have been installed: -Outdoor Air Damper _____ -Return Air Damper _____	MC	
2.11	Verify unit to duct flex connectors are installed tight and undamaged.	MC	
2.12	Verify damper linkages at each damper are tight.	MC	
2.13	Verify end of damper shaft at each damper has a score mark indicating damper position.	MC	
2.14	Verify all access doors close tightly, are gasketed and are air tight.	MC	
2.15	Verify door latches maintain a good tight seal when secured.	MC	
2.16	Verify the correct filters are installed and fit tight in the filter rack.	MC	



# AHU CC, HC, OA& VFD, 3 Phase, AHU-\_\_\_\_

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Task No.	Task Description	Contractor	Contractor Initial and Date
2.17	Verify all penetrations through unit panels and unit enclosure are sealed.	MC	
2.18	Verify caulked seams and air seals are intact.	MC	
2.19	Verify the unit is clean and free of damage, both inside and outside.	MC	
2.20	Verify equipment ID labels for the unit and associated sensors are correct and permanently affixed.	MC	
<b>3</b>	<b>Coils, Piping and Valves</b>		
3.1	Verify piping installation is complete and properly supported.	MC	
3.2	Verify piping pressure testing has been completed.	MC	
3.3	Verify piping has been flushed and flushing has been properly documented per specifications.	MC	
3.4	Verify piping connections have been completed and are connected to the appropriate inlet/outlet points on the AHU. Confirm that flexible connections have been used as indicated in the contract documents.	MC	
3.5	Verify isolation valves have been installed in an easily accessible location in both the supply and return water piping of the chilled water coil.	MC	
3.6	Verify pressure gauges and thermometers have been installed in an easily accessible location in both the supply and return water piping of the chilled water coil.	MC	
3.7	Verify a normally closed, 2-way control valve has been installed in an easily accessible location in the chilled water return piping.	MC	
3.8	Verify a strainer with a drain valve has been installed in the chilled water supply piping.	MC	
3.9	Verify manual air vents have been installed at the high points in the chilled water supply and return piping.	MC	
3.10	Verify a balancing valve has been installed in the chilled water return piping.	MC	
3.11	Verify isolation valves have been installed in an easily accessible location in both the supply and return water piping of the hot water coil.	MC	
3.12	Verify pressure gauges and thermometers have been installed in an easily accessible location in both the supply and return water piping of the hot water coil.	MC	
3.13	Verify a normally open, 2-way control valve has been installed in an easily accessible location in the hot water return piping.	MC	
3.14	Verify a strainer with a drain valve has been installed in the hot water supply piping.	MC	
3.15	Verify manual air vents have been installed at the high points in the hot water supply and return piping.	MC	
3.16	Verify a balancing valve has been installed in the hot water return piping.	MC	
3.17	Verify the coils are clean, the fins are not damaged and there are no leaks.	MC	
3.18	Verify coil piping connections are tight and are not leaking.	MC	
3.19	Verify valves have been installed facing in the correct direction, based on the direction of water flow.	MC	
3.20	Verify strainers are clean.	MC	
3.21	Verify valves and pipes are properly insulated.	MC	
3.22	Verify valves are labeled.	MC	
3.23	Verify piping has been properly labeled.	MC	

# AHU CC, HC, OA& VFD, 3 Phase, AHU-\_\_\_\_

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Task No.	Task Description	Contractor	Contractor Initial and Date
3.24	Verify a condensate pan has been installed under the chilled water coil.	MC	
3.25	Verify the condensate pan is clean.	MC	
3.26	Verify water in each condensate pan flows towards the associated drain connection.	MC	
3.27	Verify AHU condensate drain has been installed per detail 2/M-702 in the contract documents.	MC	
<b>4</b>	<b>Electrical</b>		
4.1	Verify safety disconnect switch is installed within line of sight of unit and labeled.	EC	
4.2	Verify motor is labeled for use with a Variable Frequency Drive (VFD).	EC	
4.3	Verify VFD has been provided with Hand/Off/Auto selection settings through a switch or the VFD keypad.	EC	
4.4	Verify VFD has been provided with Local/Remote speed selection settings through a switch or the VFD keypad.	EC	
4.5	Verify VFD has been provided with a three contactor, Line Bypass selection switch to bypass the VFD and operate the fan using line voltage.	EC	
4.6	Verify properly sized and adjusted electrical motor protection with manufacturer's rating plate and record. Motor FLA Amperage _____. Protection Device (FLA _____ X 125%) Amperage _____.	EC	
4.7	Verify all electrical connections are tight and enclosed.	EC	
4.8	Verify adequate breaker or fuse size and note. _____ Amps.	EC	
4.9	Verify proper grounding installed for each component.	EC	
4.10	Verify grounding has been tested.	EC	
4.11	Verify supplied voltage and phase are the same as printed on rating label.	EC	
4.12	Switch off local disconnect switch and verify no power to fan is present.	EC	
4.13	Verify control devices are labeled.	EC	
<b>5</b>	<b>Pre Start-Up Verification</b>		
5.1	Verify ductwork, dampers and any other equipment that could obstruct airflow are complete.	MC	
5.2	Verify controls associated with the unit are installed, functional and have been tested.	TCC	
5.3	Verify control devices and sensors are labeled.	TCC	
5.4	Verify clean air filters are in place.	MC	
5.5	Verify fan assembly bearings and locking collars are properly tightened.	MC	
5.6	Verify fan wheel is properly aligned, tight on the shaft and freely moving.	MC	
5.7	Verify fan bearings are properly lubricated	MC	
5.8	Verify fan sheaves are properly aligned and tight on the shaft.	MC	
5.9	Verify belt tensions are correctly adjusted and record. Initial Tension Reading ft-lbs _____ (After 8 hrs run time reading ft-lbs _____), (After 16 hrs run time, Reading ft-lbs _____), (After 24 hrs run time, Reading ft-lbs _____). Note: Correct belt tension information is located on the blower housing. Belt should not squeal on start-up.	MC	
5.10	Verify motor mounting bolts and adjustable motor base bolts are tight.	MC	



# AHU CC, HC, OA& VFD, 3 Phase, AHU-\_\_\_\_

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Task No.	Task Description	Contractor	Contractor Initial and Date
5.11	Confirm that VFD has been started up by VFD manufacturer's certified representative and associated controls have been tested. (Start-up documentation must be pre-approved by CxA)	EC	
5.12	Verify and record actual line voltage to VFD and fan motor with VFD set at 100% fan speed. VFD Ph A-B _____ Ph A-C _____ Ph B-C _____ Motor Ph A-B _____ Ph A-C _____ Ph B-C _____	EC	
5.13	Verify and record actual motor amperage with VFD set at 100% fan speed. Motor Ph A _____ Ph B _____ Ph C _____	EC	
5.14	Verify proper fan rotation.	EC	
5.15	Verify no unusual vibration or noise at any normal operating frequency.	MC	
5.16	Verify no obvious audible air leaks.	MC	
5.17	Confirm unit is ready for the Test and Balancing (TAB) contractor. (TAB to be complete before FPT occurs.)	MC	
5.18	Certify unit is ready for Functional Performance Testing (FPT).	GC	
	<b>Stipulate, if any outstanding item(s) preclude safe or reliable Functional Performance Testing.</b>		
Notes			
<b>Checklist items have been initialed by parties having direct knowledge of the event. Completion of checklist items <u>does not</u> indicate acceptance or responsibility by the owner.</b>			
General Contractor's Signature _____		Date _____	
Mechanical Contractor's Signature _____		Date _____	
Electrical Contractor's Signature _____		Date _____	

# Terminal Box with HW Re-Heat, VAV-\_\_\_\_\_

## Construction Verification Checklist



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Task No.	Task Description	Contractor	Contractor Initial and Date
<b>1</b>	<b>Equipment Delivery and Acceptance Verifications</b>		
1.1	<b>Note:</b> Record actual Name Plate Data and confirm unit is as specified in the contract documents: Manufacturer: _____ Model Number: _____; Size: _____ Serial Number: _____ CFM (MIN/MAX): _____ Heating Coil Flow Rate: _____ GPM; BTUH: _____	MC	
1.2	Verify date of manufacture. (Verify by date tag or serial number. If date exceeds 16 weeks notify RE and CxA).	MC	
1.3	Verify terminal unit is free of physical damage (dents, holes, etc.).	MC	
1.4	Verify terminal unit is stored in a safe and dry environment.	MC	
<b>2</b>	<b>Basic Installation</b>		
2.1	Verify terminal unit is installed in the proper location per contract documents.	MC	
2.2	Verify terminal unit is securely mounted per manufacturers recommendations.	MC	
2.3	Verify vibration and sound isolation equipment is installed as per contract documents.	MC	
2.4	Verify terminal unit does not contact other obstacles which could cause noise or vibration transmission.	MC	
2.5	Verify terminal unit is level.	MC	
2.6	Verify terminal unit has free access to the control components.	MC	
2.7	Verify sufficient space clearance has been provided for the electrical power and control access points and that minimum clearances have been provided per electric code.	MC	
2.8	Verify sufficient access and clearance to and around terminal unit for servicing. (Access is defined as sufficient space for a middle aged man of average size and health to be able to perform necessary maintenance and repairs.)	MC	
2.9	Verify that a minimum of 3 duct diameters of straight inlet duct, the same size as the terminal unit inlet, is installed.	MC	
2.10	Verify terminal unit to duct discharge flex connector is installed and undamaged.	MC	
2.11	Verify discharge ductwork is connected.	MC	
2.12	Verify damper linkages are tight.	MC	
2.13	Verify end of damper shaft has score mark indicating damper position.	MC	
2.14	Verify all packing material is removed from inside of the terminal unit.	MC	
2.15	Verify all penetrations through terminal unit panels and enclosure are sealed.	MC	
2.16	Verify access doors close tightly and gaskets are not damaged.	MC	
2.17	Verify terminal unit is clean and free of damage, both inside and outside.	MC	
2.18	Verify all air balancing devices are installed per contract documents.	MC	
2.19	Verify all sensor locations are appropriate and away from causes of erratic operation.	MC	
2.20	Verify permanent equipment ID labels for the terminal unit and associated space mounted sensors are correct and permanently affixed.	MC	



# Terminal Box with HW Re-Heat, VAV-\_\_\_\_\_

## Construction Verification Checklist



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Task No.	Task Description	Contractor	Contractor Initial and Date
<b>3</b>	<b>Coils, Piping and Valves</b>		
3.1	Verify piping installation is complete and properly supported.	MC	
3.2	Verify piping pressure testing has been completed.	MC	
3.3	Verify piping has been flushed and flushing has been properly documented per specifications.	MC	
3.4	Verify piping connections are complete and connected to the proper inlet/outlet connections at hot water coil.	MC	
3.5	Verify isolation valves have been installed in an easily accessible location in both the supply and return water piping of the hot water coil.	MC	
3.6	Verify a 2-way control valve has been installed in an easily accessible location in the hot water supply piping. Confirm valve fails in the last commanded position.	MC	
3.7	Verify coil piping connections are tight and are not leaking.	MC	
3.8	Verify the coil is clean, the fins are not damaged and there are no leaks.	MC	
3.9	Verify a strainer with a drain valve has been installed in the hot water supply piping.	MC	
3.10	Verify a manual air vent has been installed in the hot water return piping.	MC	
3.11	Verify a balancing valve has been installed in the hot water return piping.	MC	
3.12	Verify valves have been installed facing the correct direction, based on the direction of water flow.	MC	
3.13	Verify strainer is clean.	MC	
3.14	Verify valves are labeled.	MC	
3.15	Verify piping has been properly labeled.	MC	
3.16	Verify valves and pipes are properly insulated.	MC	
<b>4</b>	<b>Pre Start-Up Verification</b>		
4.1	Verify controls associated with the terminal unit are installed, functional and have been tested.	TCC	
4.2	Verify damper control will move freely between minimum and maximum control range.	TCC	
4.3	Verify control devices and space sensors are labeled.	TCC	
4.4	Verify ductwork, diffusers, dampers and any other equipment that could obstruct airflow are complete.	MC	
4.5	Verify associated Air Handling Unit (AHU) has been started and is providing the minimum airflow required to allow operation of the terminal unit.	MC	
4.6	Verify no obvious audible air leaks.	MC	
4.7	Verify no unusual vibration or noise.	MC	
4.8	Confirm unit is ready for the Test and Balancing (TAB) contractor. (TAB to be complete before FPT occurs.)	MC	
4.9	Certify unit is ready for Functional Performance Testing (FPT).	GC	
	Stipulate, if any outstanding item(s) preclude safe or reliable functional performance testing.		

# Terminal Box with HW Re-Heat, VAV-\_\_\_\_

## Construction Verification Checklist



1100 North Glebe Road, Suite 500  
Arlington, VA 22201  
Tel: (571) 218-1000  
Fax: (571) 218-1600

FAA - ZSE Air Route Traffic Control Center  
AWR2 Project - Seattle, Washington

Task No.	Task Description	Contractor	Contractor Initial and Date
Notes			
<b>Checklist items have been initialed by parties having direct knowledge of the event. Completion of checklist items <u>do not</u> indicate acceptance or responsibility by the owner.</b>			
	General Contractor's Signature_____		Date _____
	Mechanical Contractor's Signature_____		Date _____
	Electrical Contractor's Signature_____		Date _____



***Department of Transportation  
Federal Aviation Administration***

# COMMISSIONING PLAN

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**Automation Wing Rehabilitation - 2nd Floor and Attic**

**Seattle Air Route Traffic Control Center  
Auburn, Washington**

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## 1.0 Introduction

### 1.1 Commissioning Overview

Commissioning (Cx), as being implemented for the ZSE AWR2 project, is a systematic process to ensure building HVAC systems installed in the Automation Wing Attic and Second Floor perform correctly and interactively according to the intent of the contract documents and the Federal Aviation Administration's (Owner) operational needs. The Commissioning Plan (CxP) is used to guide the activities of the parties involved in the Commissioning process. The Commissioning process will continue through the construction phase and acceptance of the building HVAC systems.

#### **Elements of Building Commissioning Include:**

1. Review of submittal data.
2. Incorporation of specific equipment data into the CxP.
3. Development of Construction Verification Checklists (CVC) for new HVAC equipment and HVAC systems being commissioned.
4. Review of design/construction modifications.
5. Development of Functional Performance Tests (FPT) for HVAC systems being commissioned. FPTs will be based on contract documents and approved submittals for HVAC systems installed. FPTs will exclude Commissioning testing of Electrical Systems, Lighting Systems, Telecommunication Systems, Public Address Systems, Fire Alarm Systems, Sprinkler Systems, Elevators and any FAA Special Systems such as Air Traffic Control Equipment.
6. Completion of specific systems/equipment CVCs.
7. Performance of FPTs.
8. Provide to the FAA an unbiased, objective view of the built systems and equipment installation, operation, and functional performance.

### 1.2 Commissioning Plan

The Commissioning Plan describes the responsibilities of the key personnel involved in the design, construction, Commissioning process and procedures. The Commissioning Plan outlines the Commissioning process to ensure building systems are installed according to contract documents, and operate within the performance guidelines set out in the contract documents. All parties shall ensure the building systems and equipment are installed, started, tested and documented to meet the FAA's needs and to ensure that operations and maintenance personnel are fully trained.

### 1.3 Project Description

This project provides for the renovation of the Automation Wing Second Floor and Attic at the Seattle, WA ARTCC facility in Auburn, WA. The work includes replacement of existing walls, and construction and finishing of new interior office walls. The existing mechanical and electrical systems will all be upgraded as well. The mechanical upgrades include the

installation of new air handling units, VAV terminal units and the associated ductwork, piping, and controls. Also included are new exhaust fans, humidifiers, fin tube radiators, plumbing fixtures, and pre-action fire sprinkler systems. Electrical upgrades include the installation of new lighting, power, public address, LAN, telephone, and fire detection systems.

## **1.4 Abbreviations**

**The following are common abbreviations used in this document.**

- ARTCC – Air Route Traffic Control Center
- ATC – Automatic Temperature Control Contractor
- CVC – Construction Verification Checklist
- Cx – Commissioning
- CxA – Commissioning Agent
- CxP – Commissioning Plan
- CxT – Commissioning Team
- DDC – Direct Digital Control
- DDCS – Direct Digital Control System
- DM – Design Project Manager
- EC – Electrical Contractor
- ESU – Environmental Support Unit
- FAC – Fire Alarm Contractor
- FPT – Functional Performance Test
- GC – General Contractor
- MC – Mechanical Contractor
- NBS – National Bureau of Standards
- NIST – National Institute of Standards and Technology
- O&M – Operations and Maintenance
- OPR – Operational Performance Requirements
- RE – Resident Engineer
- RFI – Request for Information
- TAB – Test, Adjust and Balance
- ZSE – Seattle Air Route Traffic Control Center, Auburn, WA

## 2.0 Roles and Responsibilities

### 2.1 Owner Responsibilities

#### The Federal Aviation Administration (FAA)

1. The FAA defines the overall vision for the use of the facility, establishes Operational Performance Requirements (OPR) and Commissioning objectives, appoints the Resident Engineer (RE), establishes the construction budget, and ultimately accepts and operates the finished facility.
2. The FAA appoints the Resident Engineer (RE) as the FAA's contracting officer's technical representative. The RE is the primary day-to-day FAA point of contact. The RE is responsible to ensure work is completed in accordance with the contract document requirements and that the FAA's design intent is met upon completion. The RE is the single point of contact for coordinating work with the FAA operations and accepting submittals, deliverables and completed work.
3. The FAA provides appropriate facilities for all training sessions.
4. The FAA provides appropriate personnel to attend all training sessions.

### 2.2 Project Design Manager (DM) Responsibilities:

The DM leads the design team that is composed of architects and engineers who prepare the design documents that reflect the design intent of the FAA. The design intent requires that the installed systems can be tested against predetermined criteria and the commissioned equipment can operate as intended. The DM's role in commissioning during the construction phase includes submittal reviews, RFI responses and periodic site visits. The DM does not play a large role in day-to-day performance verification or quality control. The DM's role in commissioning includes dealing with design conformance and other issues identified during the commissioning process.

#### The DM:

1. Translates the FAA's requirement into technical design intent.
2. Prepares thorough, accurate, and clear contract documents.
3. Develops/updates the Operational Performance Requirements (OPR).
4. Incorporates commissioning specifications and related information into construction specifications.
5. Supports and advises the Commissioning Authority (CxA) in developing testing documents.
6. Issues clarifications or interpretations of Design Intent as required.
7. Provides the CxA one copy of all approved technical submittals.
8. Provides the CxA one copy of correspondence regarding all RFI's.
9. Consults and resolves any design related issues/problems that arise during the construction.
10. Copies the CxA on changes relating to systems and equipment to be commissioned.

### **2.3 Resident Engineer (RE) Responsibilities:**

The RE is the Government representative responsible for accepting the work. The CxA will work closely with the RE regarding HVAC equipment and system performance, and will make recommendations to the RE regarding acceptance.

#### **The RE:**

1. Assembles the Commissioning Team (CxT).
2. Attends design, construction, and commissioning related meetings.
3. Coordinates site visits and testing with the CxA.
4. Monitors/reviews CVC's to ensure the results are documented as the checklists are completed.
5. Monitors controls point-to-point checks performed by the controls contractor and ensure the results are documented as the checks are completed.
6. Oversees all or part of testing of the control system and approves it for use by TAB, before TAB is executed.
7. Receives TAB plans and reports. Coordinates their review.
8. Participates at their discretion in Functional Performance Testing.
9. Coordinates training with the maintenance staff and the General Contractor and approves training plans.
10. Coordinates submission and review of the Operations and Maintenance documentation and approves Operations and Maintenance documentation.
11. Reviews and approves GC maintenance schedules for equipment operated by the GC prior to acceptance.
12. Review and approve the preparation of the final O&M manuals. Ensure required O&M manuals, instructions and demonstrations are provided to the FAA's designated operating staff.
13. Review equipment warranties to ensure that the FAA's responsibilities are clearly defined.

### **2.4 General Contractor (GC) Responsibilities**

The GC has overall responsibility and authority to ensure compliance with and coordination of the Contract Documents. This responsibility includes the following:

1. Comply with the Construction Documents.
2. Coordinate meetings, schedules, and Commissioning activities with the CxA.
3. Facilitate communications among installers and suppliers and other CxT members, and foster the necessary cooperative action.
4. Involve installers in the Commissioning Process.

5. Obtain O&M documentation for updating commissioning checklists.
6. Ensure Construction Verification Checklists (CVCs) are completed and associated work performed, prior to scheduling of FPTs.
7. Ensure Functional Performance Tests (FPTs) are performed and checklists completed.
8. Notify the RE and CxA a minimum of two weeks in advance of scheduled HVAC equipment and system start-ups, and CVC's.
9. Implement corrective actions.
10. Coordinate specified training.
11. The GC shall coordinate with the RE and CxA. Coordination shall include, but not be limited to the following:
  - a. CxA site visits,
  - b. Planning,
  - c. Scheduling,
  - d. Communication with the CxT,
  - e. Corrective actions, and
  - f. Specified training.

## **2.5 Commissioning Agent (CxA) Responsibilities**

The primary role of the CxA is to develop, coordinate and execute a testing plan, document the performance, and confirm proper HVAC system functionality in accordance with the OPR and Contract Documents. The CxA facilitates the overall Commissioning process.

The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. These are responsibilities of the DM, GC and the subcontractors. The CxA shall assist with problem solving, and resolving non-conformance, or deficiency issues.

### **The Commissioning Agent (CxA):**

1. Develops a Commissioning Plan, which describes in general the extent of the HVAC Commissioning process to accomplish the design intent and coordinate with the construction schedule.
2. Coordinates Commissioning activities in a logical, sequential and efficient manner.
3. Kicks off the commissioning effort. Conducts an initial CxT meeting to describe the process, review roles and responsibilities, set expectations, establish communication and coordinate the work.
4. Schedule and lead commissioning meetings as needed with the Commissioning Team.
5. Develops Construction Verification Checklists (CVCs) and Functional Performance Tests (FPTs) based on the Contract Documents, manufacturers O&M information, and accessibility requirements for O&M. Brings to the attention of the DM, GC, and RE identified deficiencies and coordination problems with HVAC systems/equipment to be commissioned.

6. Reviews completed CVCs to ensure the results are documented properly as the checklists are completed and to evaluate any issues which are documented in the CVCs.
7. Tracks testing non-conformance. Participates in re-testing as necessary until satisfactory performance is achieved as requested by the FAA.
8. Compile and maintain organized and complete commissioning records.
9. Review approved submittals applicable to the systems being commissioned to assist in development of testing checklists.
10. Review requests for information and change orders for impact on commissioning.
11. Establishes test plans and cooperates with schedules set up by CxT.
12. Coordinate with the RE & GC to monitor Functional Performance Testing for commissioned systems and assemblies. Witness and document Functional Performance Tests performed by the Contractor for all commissioned HVAC systems and assemblies.
13. The Functional Performance Testing will include operating the system and components through each of the written sequences of operation, and other significant modes and sequences, including start-up, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure and interlocks with other systems or equipment. Sensors and actuators shall be calibrated by the installing contractors, and spot-checked by the commissioning provider during Functional Performance Testing. Coordinate retesting as necessary until satisfactory performance is achieved. Tests on respective HVAC equipment shall be executed, if possible, during both the heating and cooling seasons. However, some overwriting of control values to simulate conditions may be required. Functional Performance Testing shall be done using conventional manual methods and readouts, to provide a high level of confidence in proper system function, as deemed appropriate by the FAA.
14. Maintain a master issues log and a separate record of Functional Performance Testing. Report all issues to the RE as they occur. Provide written progress reports and test results with recommended actions.
15. If requested by the CxT attend selected planning and job-site meetings to obtain information on construction progress.
16. Reviews TAB execution plan and reports.
17. As a part of the FPTs, monitors control point-to-point checks performed by the controls contractor and ensures the results are documented as the checks are completed.
18. Reviews FPTs and analyze data to verify performance.
19. Document design non-compliance and deficiencies identified in all phases of Commissioning.
20. Recommends acceptance of tested systems and equipment commissioned to the RE.
21. Provides a final Commissioning Report that will include:
  - An Executive Summary
  - List of participants and roles



- Brief project description
- Overview of Commissioning and testing scope
- General description of testing and verification methods.

For each piece of commissioned HVAC equipment, the report will contain the disposition of the Commissioning Authority regarding the adequacy of the equipment. Outstanding non-compliance and deficiencies shall be specifically listed. Appendices shall contain acquired documentation of all completed CVCs, FPTs, deficiency lists, site visit reports, general findings and unresolved issues.

## **2.6 Subcontractors Commissioning Responsibilities:**

1. Cooperate with the CxT to facilitate the successful completion of the Commissioning process.
2. Assign a representative to the CxT, and submit the person's name to the RE and CxA, within one month of the Award of the Contract. The representative shall have the authority to make decisions on behalf of the contractor as they relate to the Commissioning processes. The representative shall establish communications among contractor and suppliers and all other CxT members, and shall foster the necessary cooperative action.
3. Attend CxT meetings, and ensure action items arising from these meetings are responded to as required to allow the Commissioning Process to proceed on schedule.
4. Ensure cooperation and participation of specialty subcontractors as applicable.
5. Ensure participation of major equipment manufacturers as appropriate in start-up, testing and training activities.
6. Notify the GC a minimum of two weeks in advance of scheduled equipment and system start-ups, and CVC's so the RE may witness.
7. Inspect, check and confirm that the correct and complete installation of all systems, sub-systems and component start-up for each system CVC's are performed. Document the results of inspections and checks on the checklists and sign them. If deficient or incomplete work is discovered, ensure corrective action is taken and re-check until the results are satisfactory and the system is ready for safe start-up.
8. Provide all tools/equipment and personnel required to perform all checks and tests.
9. Provide Operations and Maintenance Documentation in accordance with the construction specifications.
10. Provide equipment inventory information in accordance with the specifications.
11. Develop and execute orientation and training in accordance with contract documents.
12. Provide personnel to assist the CxA during system verification and FPTs. Operate equipment and systems for FPTs in accordance with the Commissioning Plan and as directed by the CxA. If improper functionality, incomplete work, or other deficiencies affecting system performance are discovered, the CxA will stop the FPTs. Those responsible for deficient or incomplete work will be responsible to ensure corrections necessary for full and complete system operation as specified are completed.



## 3.0 Commissioning Process

The Commissioning Process is intended to provide the FAA with assurance that building HVAC systems and equipment have been installed in accordance with Contract Documents, and operate within performance guidelines specified.

**The Commissioning Agent will provide the FAA with an unbiased, objective view of the built HVAC systems and equipment installation, operation, and functional performance.** The Commissioning Process **does not** remove or reduce the responsibility of the GC and subcontractors to provide a finished product, installed and fully functional in accordance with the contract documents.

Commissioning is intended to confirm and approve system start-up and aid in the orderly completion and transfer of building systems and equipment for use by the FAA. The CxA is the leader of the CxT. This leadership includes planning and coordinating Commissioning activities in conjunction with the design professionals, construction manager, subcontractors, manufacturers and equipment suppliers.

### 3.1 Commissioning Related Specifications

The DM has sole responsibility for the technical specifications. The CxA will develop the following commissioning related specification:

- Section 01810 “Commissioning Requirements”

### 3.2 Commissioning Related Requirements

Commissioning related requirements are also included in the contract documents and include but are not limited to:

1. Identification of the Commissioning Agent and commissioning role and responsibilities.
2. A summary of the roles and responsibilities of all other Team members
3. A list of the building systems, equipment and interfaces to be commissioned.
4. CVCs checklists and FPTs checklists for systems being commissioned.
5. Commissioning responsibilities of the GC and subcontractors, whose scope of work includes building systems and equipment to be commissioned by the Commissioning Agent. These responsibilities apply to all subcontractors, sub-trades and suppliers associated with work on building systems and equipment to be commissioned.
6. Commissioning Issues Log
7. Commissioning Field Reports
8. Cross-references included in other sections of the specification where contractor or trade-specific commissioning requirements are applicable.

### 3.3 Review of the Commissioning Plan

The RE, DM, and GC shall review the Commissioning Plan. The document will be distributed to the CxT for information and action.

### 3.4 Support for Commissioning

The Commissioning Agent provides leadership by communicating goals for the Commissioning process, including verification of roles and responsibilities of Team members, and clearly defines and documents pass/fail criteria. Each CxT member shares responsibility to support the Commissioning Process and achieve a quality installation.

### 3.5 Commissioning Meetings

The CxA will facilitate the initial Commissioning Kick Off meeting and will conduct commissioning meetings during site visits as needed. During the construction period, the RE will coordinate with the GC to schedule Commissioning meetings in conjunction with regular progress meetings. Dates, times and prerequisites for upcoming Commissioning checks, start-ups, or tests will be established. Issues will be raised and problems identified with required action decided, and a date for completion determined. CxT members are responsible for attending Commissioning meetings and for completing assigned action items by the assigned dates. Cooperation is critical to successful Commissioning.

### 3.6 Coordination Planning

The RE and GC will coordinate day to day commissioning activities. The RE and CxA will coordinate CxA site visits. It is anticipated the CxA will conduct one site visit to kick off the Cx process and two site visits for Functional Performance Testing and Re-testing.

### 3.7 Submittal Review

Submittal reviews will be performed by the Government. The CxA will be provided copies of approved submittals as they are applicable to the systems being commissioned.

### 3.8 Construction Quality Control Activities

The GC, subcontractors and suppliers are responsible for quality control and are responsible for supplying materials and installation of work in accordance with standard industry practices, contract documents, and the project schedule. Commissioning is not a substitute for Quality Control.

Early planning and scheduling activities in the construction phase of the Commissioning process are necessary to create a coordinated and realistic schedule, and thus avoid delays. CVCs are particularly important. As scheduled start-up times approach, **the checklists serve to highlight items for the RE's & GC's attention.**

Checklists for upcoming start-ups are reviewed at Construction Meetings to confirm readiness, and incomplete items will become issues for tracking and resolution. It is critical that the CVCs be complete and approved PRIOR to the related FPT to ensure deficiencies are minimized to avoid unnecessary delay in construction and acceptance.

### 3.9 Construction Issues Tracking

The GC and subcontractors are responsible for the overall construction process, including the necessary scheduling and coordination. The CxA will maintain a "Commissioning Issues

Log” document to ensure that issues encountered during the Commissioning process are documented, followed up, and kept visible until resolved.

It is the responsibility of the appropriate team member to address and resolve all applicable items in a timely manner, to avoid impacts on schedule and acceptance testing.

### **3.10 Project Schedule Updates**

The RE, GC and CxA shall periodically review the updated project schedule to ensure that all required Commissioning activities are incorporated, time allowances are adequate, and installation sequences are logical and properly coordinated with other construction activities.

### **3.11 CxA Site Visits**

The CxA will observe the installation periodically to assess construction compliance with the Operational Performance Requirements (OPR). It is anticipated the CxA will make three site visits.

The first site visit will be a one day visit shortly after the GC mobilizes. The purpose of the site visit will be to assemble the CxT and conduct a kick off meeting. The meeting will include a review of the commissioning process, commissioning requirements, roles and responsibilities and major commissioning issues and milestones. During the kick off meeting schedule, coordination, communication and process management will be discussed. Also any construction or design issues will be discussed.

The second site visit will be a five day visit when HVAC equipment installation is complete. The purpose will be to direct and witness Functional Performance Tests and to verify completion of CVC checks and startup tests.

The third site visit will be a two to three day visit to perform system re-testing based on the results of the FPTs performed during the second site visit.

### **3.12 Construction Verification Checklists (CVCs)**

CVCs verify that systems and equipment are installed properly, conform to the Contract Documents and are ready for safe start-up. The responsibility for carrying out these checks, as well as any corrective action, lies with the GC and subcontractors. The CxA will prepare the CVCs and issue the CVCs to the D&BOC prior to startup of the equipment being commissioned. Completion of checklists items does not indicate acceptance by the CxA or the FAA.

Checks developed for the project will include steps that are typically required and verification inspection checks that must be carried out and documented prior to and during start-up and performance testing. Commissioning checklists and the equipment list will be developed and updated as the design progresses and as specific manufacturers and models of equipment are submitted by the GC and approved for installation.

#### **Start-Up Checks**

Start up checks typically refer to the static testing or check out of systems or equipment to ensure proper and complete operation and readiness for FPT. Start-up checks are incorporated into the CVCs and include items such as verifying proper voltage, alarming, rotation, etc. The start-up procedures and/or checks are typically obtained from manufacturers' O&M manuals and the Contract Documents and performed by the authorized manufacturer's start-up representative. These are done prior to Functional Performance Testing.

### **3.13 Functional Performance Tests (FPTs)**

After reviewing the approved submittals, and the construction documents, the CxA authors the FPTs for each system-to-be-commissioned. The FPTs are based upon the construction documents, specifications and submittals. FPTs should progress from individual items of equipment and sub-systems, to complete systems, to integration between other systems, depending on the scope of the Commissioning Plan. This test progression helps to isolate the cause of problems as it verifies correct operation of smaller components of the installation before moving on to tests involving larger systems or integration between systems.

The GC is responsible for operating the systems as directed by the CxA. The CxA directs, witnesses and documents the results of the FPTs of building systems-to-be-commissioned. Completion of FPT items **does not** indicate acceptance by the CxA or FAA.

### **3.14 Test, Adjust and Balance (TAB)**

Before executing their work, the TAB subcontractor must submit to the RE and DM for review and approval a plan detailing the TAB procedures and instruments planned for use on the project. The plan shall include the formats in which results will be reported, including a preliminary TAB report representing the project's equipment design parameters on approved data sheets. The TAB subcontractor shall also describe the operational conditions required before HVAC systems shall be ready for balancing. During early construction the TAB subcontractor provides comments from their review of contract documents pertaining to provisions for testing air and water flows, temperatures and pressures.

The TAB subcontractor shall submit a tentative schedule for their work. The schedule includes site visits to evaluate the impacts of as-built conditions on the planned procedures and schedule, and to determine when the installation shall be ready for on-site TAB work. The RE, DM and GC shall review this information.

#### **TAB Services**

The TAB subcontractor is responsible to check that prerequisites for the start of TAB services have been completed prior to initiating their fieldwork.

The TAB subcontractor shall perform TAB services in accordance with the Contract Documents and the procedures submitted and approved at the beginning of the construction phase.

Where controls need to be calibrated against measured air or water flows, the ATC subcontractor must work with the TAB subcontractor so that the related measurements and calibrations are coordinated, and the results documented.

TAB equipment used for testing and calibration shall be NIST/NBS traceable and calibrated within the preceding six-month period. Certificates of calibration must be submitted previous to any TAB testing.

### **TAB Report**

The TAB subcontractor shall complete and submit a preliminary TAB report to the RE. The RE will verify the TAB report both by reviewing the report and duplicating field tests. The TAB subcontractor shall provide necessary personnel and equipment to assist in verification. The TAB subcontractor shall address inconsistencies identified during verification or designer comments and resubmits the final TAB report to the RE for approval. A copy of the preliminary TAB report will be provided to the CxA prior to starting Functional Performance Tests.

## **3.15 HVAC Controls Installation**

The ATC subcontractor is responsible for documenting all aspects of the controls installation. At a minimum, the following record documentation (as-built) information shall be included:

1. Data on all components included with the controls installation, including general description, parts lists, technical & applications data, and installation, calibration and maintenance information.
2. Schematic diagrams of the entire controls system as specified.
3. A complete points list, with records of point-to-point wiring, documented field locations and device test.
4. Complete written sequences of controls for all systems, with details of final values for all parameters and set points.
5. Clearly labeled control panels and devices as specified.

### **Controls Point-to-Point Checks**

The ATC subcontractor shall carry out point-to-point control checks, and document the results on checkout sheets. These checks confirm control point wiring has been correctly installed and terminated, sensors have been calibrated, and field devices operate correctly. This involves physical observation of device responses by the ATC subcontractor to ensure they match control system displays. The RE will verify the results reported by the ATC subcontractor, and provide this information to the CxA for inclusion in the Commissioning Report. The RE will employ sampling techniques to document verification of point-to-point checkouts. Direct monitoring of the ATC checkout process facilitates conformance with the OPR.

## **3.16 HVAC System Start-Ups**

The GC and subcontractors are responsible for starting HVAC equipment and systems in accordance with the Contract Documents. No equipment shall be started until appropriate Commissioning Plan documentation (including completed CVCs) has been completed and the start-up time and date has been scheduled and approved in advance.

Before starting equipment or systems, subcontractors must complete the relevant CVCs. When the specification requires a manufacturer's certified technician, the technician, using the manufacturer's start-up procedure and documentation, must perform the start-up. The RE will observe major start-ups. Abnormalities occurring or corrective actions taken during start-up of equipment or systems will be noted in the Commissioning start-up documentation. Conditions not in compliance with Contract Documents or manufacturer's recommendations will preclude operation of affected systems until such conditions are corrected. The RE makes final decisions regarding a system's readiness for operation.

The RE will witness selected start-ups, and document the results using the start-up checklists and other provisions in the Commissioning Plan. When the manufacturer's technician does the start-up, a copy of the manufacturer's start-up report will be attached to the CVC.

### **3.17 Deficiencies and Re-test**

The GC will ensure equipment and systems as well as subcontractors and suppliers are ready for Commissioning tests, inspections and any necessary re-testing.

Incomplete work or deficiencies discovered in CVCs, or FPTs will be corrected by the responsible subcontractors and re-tested to produce satisfactory results prior to proceeding to the next stage of the Commissioning process. The GC is responsible for deficient or incomplete work and will be responsible to ensure corrections necessary for full and complete system operation as specified are completed.

In the event the deficiencies cannot be completed within two initial tests, responsible subcontractor shall pay CxA's cost of retest plus any additional cost incurred for travel expenses for subsequent tests.

### **3.18 Acceptance**

The Acceptance Phase immediately follows the Construction Phase and the successful completion of FPTs. During the Acceptance Phase, the FAA staff receives the documentation and training necessary for effective operations and maintenance of building systems. Acceptance of the building by FAA initiates specified warranties. Commissioning clarifies requirements for initiation of the warranty period. The requirements for acceptance will be defined by the FAA.

## 4.0 Commissioning Protocols

The following Commissioning protocols shall be followed:

1. No communication from the CxA will be interpreted as a work directive. Commissioning Issues Log updates resulting from testing will be provided to the GC through the FAA RE, but this does not imply that the work is complete or that the identified deficiencies will be acted upon or how to resolve them.
2. Design related Commissioning issues will be referred to the GC through the RE.
3. Equipment shall not be “temporarily” started (for heating or cooling), before CVC items and manufacturers’ pre-start procedures are completed, moisture, dust and other environmental and building integrity issues have been addressed and a maintenance schedule set in place.
4. Equipment put in service for temporary use shall have a preventive maintenance schedule in place approved by the RE. The installing subcontractor shall perform maintenance in accordance with the manufacturer’s recommended maintenance schedule and take any precautionary measures necessary to protect equipment during the construction process.
5. Equipment that is operated by the GC to support the construction effort, such as providing conditioned air, shall be commissioned in accordance with this Specification before being placed in service. Temporary operation of permanent equipment shall be coordinated with the RE.
  - Maintain equipment in accordance with manufacturer's procedures and schedules. Review maintenance requirements with the RE and adjust as necessary to account for the construction environment (high dust, humidity, etc.).
  - Maintain a maintenance record of each equipment item operated prior to acceptance. Submit copies to the RE on a monthly basis.
  - Prior to acceptance, replace belts, filters, lubricants and other consumables with new and re-perform CVCs.
6. The controls system and associated equipment are not functionally tested until control points have been calibrated, point-to-point checks are completed, CVCs have been completed and FPTs are completed.
7. TAB is not performed until the building envelope is completely enclosed and ceiling complete, unless return air is ducted.
8. TAB is not performed until the controls system has been tested and approved by the RE for TAB work.



## 5.0 Appendices

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## APPENDIX A

### Participants Involved in the Cx Process:

**1. Resident Engineer (RE):**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Email Address

**2. Design Manager (DM):**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Email Address:

**3. General Contractor (GC):**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other Phone:  
Email Address:

**4. Commissioning Authority (CxA):**

Company Name: Jacobs  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Cell Ph:  
Email Address:

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**5. Mechanical Subcontractor (MC)**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Email Address:

**6. Electrical Subcontractor (EC):**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Email Address:

**7. Controls Subcontractor (ATC):**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Email Address:

**8. Fire Alarm Subcontractor (FAC):**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Email Address:

**9. TAB Subcontractor (TAB):**

Company Name:  
Address:  
Contact Person:  
Phone:  
Fax:  
Other:  
Email Address:

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## **APPENDIX B**

### **Systems and Equipment to be Commissioned**

#### **MECHANICAL SYSTEMS**

##### **HVAC System:**

- Air Handling Units
- Direct Digital Control System (DDCS)
- Humidifiers
- Exhaust Fans
- VAV Terminal Units
- Pumps

## APPENDIX C

### Construction Verification Checklists - Samples

This appendix contains samples of HVAC system/equipment CVCs similar the equipment anticipated to be installed.

The sample CVCs indicate the level of detail that is required to commission this project. **As specific equipment is approved and installation and start up information obtained, checklists shall be developed that include actual manufacturer's requirements.** The checklists include steps that are typically required, and verification inspection checks that must be carried out and documented prior to and during start-up and performance testing.

#### Sample CVCs:

##### Mechanical System Checklists:

##### HVAC System Checklists:

Air Handling Units  
VAV Terminal Units

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## APPENDIX D

### Functional Performance Tests - Samples

This appendix contains the sample Functional Performance Tests similar to the equipment anticipated to be installed.

This sample Functional Performance Tests are intended to illustrate a level of detail that is appropriate in commissioning practice and to convey the planned format. The tests include steps that are typically required, and verification inspection checks that must be carried out by the contractors, witnessed by the CxA and documented by the CxA,.

The CxA will create FPTs based on final design documents and specific equipment installed according to approved submittals.

#### Sample CVCs:

##### Mechanical System Tests:

##### HVAC System Tests:

Air Handling Units  
VAV Terminal Units

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**SECTION 01820**

**DEMONSTRATION AND TRAINING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes administrative and procedural requirements for instructing FAA's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Written documentation of training and FAA personnel comprehension.

**1.2 SUBMITTALS**

- A. Instruction Program: Sixty (60) days prior to substantial completion, submit three copies of instructional program outlines for demonstration and training, including a schedule of proposed dates, times, length of instruction time, instructors' names and instructors' qualifications for each training module. Include learning objective and outline for each training module. Instruction program shall be based upon and utilize the approved operation and maintenance manual data.
  - 1. At completion of training, submit one complete training manual for FAA's use.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test, and student evaluations of training.

**1.3 QUALITY ASSURANCE**

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.
- C. Pre-instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction including classroom training and field training.

2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.4 COORDINATION

- A. Coordinate instruction schedule with FAA operations. Adjust schedule as required to minimize disrupting FAA operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved.

### PART 2 - PRODUCTS

#### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop a comprehensive instruction program. Include individual training modules for each system and equipment not part of a system, as required by technical Specification Sections and the Schedule of Training in Part 3 of this Section.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable:

Module 1: Basis of System Design, Operational Requirements, and Criteria: Include the following:

- a. System, subsystem, and equipment descriptions.
- b. Performance and design criteria if Contractor is delegated design responsibility.
- c. Operating standards.
- d. Regulatory requirements.
- e. Equipment function.
- f. Operating characteristics.
- g. Limiting conditions.
- h. Performance curves.

Module 2: Documentation: Review the following items in detail:

- a. Operations manuals.
- b. Maintenance manuals.
- c. Project Record Documents.

- d. Identification systems.
- e. Warranties and bonds.
- f. Maintenance service agreements and similar continuing commitments.

Module 3: Emergencies: Include the following:

- a. Instructions on meaning of warnings, trouble indications, and error messages.
- b. Instructions on stopping.
- c. Shutdown instructions for each type of emergency.
- d. Operating instructions for conditions outside of normal operating limits.
- e. Sequences for electric or electronic systems.
- f. Special operating instructions and procedures.

Module 4: Operations: Include the following:

- a. Startup procedures.
- b. Equipment or system break-in procedures.
- c. Routine and normal operating instructions.
- d. Regulation and control procedures.
- e. Control sequences.
- f. Safety procedures, including lockout/tag out requirements.
- g. Instructions on stopping.
- h. Normal shutdown and re-start instructions.
- i. Operating procedures for system, subsystem, or equipment failure.
- j. Seasonal and weekend operating instructions.
- k. Required sequences for electric or electronic systems.
- l. Special operating instructions and procedures.

Module 5: Adjustments: Include the following:

- a. Alignments.
- b. Checking adjustments.
- c. Noise and vibration adjustments.
- d. Economy and efficiency adjustments.

Module 6: Troubleshooting: Include the following:

- a. Diagnostic instructions.
- b. Test and inspection procedures.

Module 7: Maintenance: Include the following:

- a. Inspection procedures.
- b. Types of cleaning agents to be used and methods of cleaning.
- c. List of cleaning agents and methods of cleaning detrimental to product.
- d. Procedures for routine cleaning
- e. Procedures for preventive/predictive maintenance.
- f. Procedures for routine maintenance.
- g. Instruction on use of special tools.

Module 8: Repairs: Include the following:



- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.
- C. Training Duration: Duration of training and demonstration is addressed under Part 3 – Execution. Training and demonstration duration for specific items within a training module may be adjusted with FAA approval to meet the overall goals of the training module.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

#### **3.2 INSTRUCTION**

- A. Qualified Facilitator shall prepare instruction program and training modules, to coordinate instructors, and coordinate between Contractor and FAA for number of participants, instruction times, dates and location.
- B. Qualified Instructors shall instruct FAA's personnel to adjust, operate, and maintain equipment and systems.
  - 1. The COTR will furnish names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide instruction on actions necessary to prepare for and execute seasonal change over.
  - 1. Schedule training through the RE with at least 30 days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document training.
  - 1. Assess and document each participant's mastery of module by use of an oral performance-based test.

2. Obtain each participant's evaluation of the training via a pre-printed survey form approved by the RE.

- E. Cleanup: Collect used and leftover educational materials. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.
- F. Record of Training. Provide a record of training. Record shall include list of attendees, student evaluation of training, evaluation of student comprehension at the end of training and recommendations for follow-on training.

### 3.3 SCHEDULE OF TRAINING

- A. Refer to individual specification sections for complete information on demonstration and training. The schedule below may not include all training requirements.

SPECIFICATION SECTION		HOURS TRAINING	NOTES
NO.	TITLE		
13850	Fire Alarm and Detection System	Three, 4 hour sessions.	Provide training for 3 shifts. Six students each session.
15135	Meters and Gages		Include in training for equipment with meters and gages.
15170	Motors		Include in training for equipment with motors.
15171	Variable Frequency Drives	Three, 2 hour sessions	3 persons each session. Include safety requirements, basic drive theory, circuit description, operation principles, DDCP interface requirements, installation, maintenance and troubleshooting.
15190	Mechanical Identification	Three, 2 hour sessions	Provide training for 3 shifts. Indoctrinate maintenance staff on tagging protocols and project tour to show locations of mechanical items identified under this project.
15325	Automatic On/Off Fire Sprinkler System	Three, 8 hour sessions for overall system. Two, 4 hour sessions for under floor system.	Provide overall system training for 3 shifts and under-floor system training for 2 shifts. Include troubleshooting. Eight students each session.
15810	Humidifiers	Two, 2-hour sessions, 2 shifts	Complete demonstration of system. Emergency procedures, system control panel operation, troubleshooting, safety requirements.
15850	Air Handling: Power Ventilators: roof-mounted exhausters, in-line centrifugal blowers, outside	Two, 2 hour sessions, 2 shifts	Complete demonstration of system. Emergency procedures, system control panel operation, troubleshooting, safety requirements.

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(SECOND FLOOR AND ATTIC)**

**July 2009**

<b>SPECIFICATION SECTION</b>		<b>HOURS TRAINING</b>	<b>NOTES</b>
<b>NO.</b>	<b>TITLE</b>		
	air intake hoods		
15854	Central Station Air Handling Units	Three, 4 hour sessions	Complete demonstration of system. Emergency procedures, system control panel operation, troubleshooting, safety requirements.
15910	Duct Accessories	Two, 1 hour sessions	Include identification of locations, operation and maintenance requirements for duct accessories located throughout the project.
15933	Air Terminals	Three, 2-hour sessions, 2 shifts	
15975	Control Systems	Five, 8 hour sessions.	Operators: Two 8 hour sessions for 2 shifts. Supervisors: One 8 hour session. Programming: Two 8 hour sessions.
15990	Testing, Adjusting and Balancing	One 4 hour session	Review the TAB report with the maintenance staff.
16195	Electrical Identification	Three 2 hour sessions	Include indoctrination of maintenance staff on tagging protocols and project tour to show locations of electrical items identified under this project. Provide training for 3 shifts.
16470	Panelboards	Two, 1 hour sessions, 2 shifts	
16770	Public Address System	Two, 2 hour sessions, 2 shifts	

**\* \* \* END OF SECTION 01820 \* \* \***

**DIVISION 2**

**SITE WORK**

## SECTION 02070

### SELECTIVE DEMOLITION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected portions of a building.
  - 2. Patching and repairs.

##### 1.2 DEFINITIONS

- A. Remove - Remove and legally dispose of items except those indicated to be reinstalled or to remain the FAA's property.
- B. Remove and Save for Reuse - Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
- C. Existing to Remain - Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the RE, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.
- D. Salvage - Detach items from existing construction and deliver them the RE.

##### 1.3 MATERIALS OWNERSHIP

Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain the FAA's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

##### 1.4 SUBMITTALS

- A. Qualification Data
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Air Quality Plan - Submit plan for maintaining fresh air in work areas and removal of odors from work area during construction. Include list of products that will emit an air-borne odor and MSDS for each product, including, but not limited to:
  - 1. Paints.
  - 2. Adhesives.

3. Sealants.
- E. Schedule of selective demolition activities indicating the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure FAA on-site operations are uninterrupted.
  2. Interruption of utility services - Indicate how long utility services will be interrupted.
  3. Coordination for shutoff, capping, and continuation of utility services.
  4. Use of elevator and stairs.
  5. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of FAA's on-site operations. Sequence to include installation of new power panel in building to minimize interruption of service.
  6. Coordination of FAA's continuing occupancy of portions of existing building.
  7. Locations of temporary partitions and means of egress.
- F. Welding and Torch Cutting Plan - Prior to any welding or torch cutting activity, submit a Welding and Torch Cutting Plan for approval by the RE. Identify the work where welding and cutting will be performed, locations of the work, types of welding and cutting being proposed, schedule for proposed welding and cutting activities and plan for protecting the facility and its occupants, operations and equipment during the welding and cutting activities. Welding and Torch Cutting Plan must follow guidance from the ESA Welding Guide. Contractor shall coordinate with COTR (RE) to obtain Hot Work Permit.
1. Building electrical power may not be used for arc welding.
  2. Building components, including structural or miscellaneous steel, may not be used as grounding return for welding activities unless approved by the RE.
  3. Provide ventilation and exhaust to the outside during welding and cutting activities to keep zone clear. Do not weld or cut unless ventilation and exhaust has been deemed acceptable by the RE.
  4. Provide non-flammable shields to protect persons and properties.
  5. Keep cylinders upright and chained or secured to support.
  6. Remove flammable materials from welding and cutting areas prior to beginning welding and cutting activities. Keep fire extinguishers in the welding and cutting areas.
  7. Follow AWS "Specification and Safety Practice Codes" as published by the American Welding Society (AWS) and OSHA Safety Requirements.
- G. Inventory of items to be removed.
- H. Inventory of items to be removed by FAA.
- I. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.
- J. Record drawings at project closeout.

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

#### 1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications - An experienced firm that is specialized in demolition work similar in material and extent to that indicated for this project.
- B. Regulatory Requirements - Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards - Comply with ANSI A10.6, NFPA 241 and the Universal Waste Rule.
- D. Predemolition Conference - Conduct conference at project site to review methods and procedures related to selective demolition including, but not limited to, the following:
  1. Inspect and discuss condition of construction to be selectively demolished.
  2. Review structural load limitations of existing structure.
  3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  5. Review areas where existing construction is to remain and requires protection.
  6. Locate proposed dust proof barriers for approval prior to proceeding with work.
  7. Review work noise or any other direct impact to the control room as determined by Air Traffic Operations. These situations may be required to be performed during low traffic periods (11:00 PM – 6:00 AM), on weekends and/or holidays to minimize impacts to Air Traffic operations. A two (2) week notice to the FAA prior to work will need to be issued by the Contractor in order for the FAA to give the workforce proper notification when noise will impact operations.

#### 1.6 PROJECT CONDITIONS

- A. Government will occupy portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so that Government's operations will not be disrupted. Provide not less than 14 calendar days notice to Government of activities that will affect Government's operations.
- B. Government assumes no responsibility for actual condition of buildings to be selectively demolished.
  1. Conditions existing at time of inspection for bidding purpose will be maintained by Government as far as practical.
- C. Hazardous Materials - Only lead-containing coatings are present in the building areas to be selectively demolished.



1. Refer to Section 02085 "Lead Coating Work Practices" for procedures regarding performance of work at lead containing coatings.

D. Storage or sale of removed items or materials on-site will not be permitted

## 1.7 SCHEDULING

Arrange selective demolition schedule so as not to interfere with FAA's on-site operations.

## 1.8 WARRANTY

Existing Special Warranty - Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

# PART 2 – MATERIAL

## 2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
  1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Use low-VOC (volatile organic compound) products. Provide newer-formulated, low-VOC products in place of existing products for repairs and renovation for the work.

# PART 3 – EXECUTION

## 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the RE.

- E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
  - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplication in final work, make permanent record of measurements, materials and construction details required to make exact reproduction.
- F. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

### **3.2 UTILITY SERVICES**

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by RE. Provide temporary services during interruptions to existing utilities, as acceptable to RE.
    - a) Provide not less than 14 calendar days notice to FAA if shutdown of service is required during changeover.

### **3.3 PREPARATION**

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from RE. Provide alternate routes and by-passes constructed to provide dust-protection around closed or obstructed traffic ways if required by governing regulations.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings, rooms, and facilities to remain. Ensure safe passage of people around selective demolition area.
  - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- C. Erect and maintain dust-proof partitions to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construct dust-proof partitions of not less than nominal 2-inch by 4-inch fire retardant wood or metal studs with flame retardant 6 mil polyethylene sheet, with joints taped and attached to the non-public side of studs to form dust-proof partition.
  2. Seal joints and perimeter. Equip partitions with gasketed or weather-stripped doors to maintain dust-proof conditions.
  3. Protect air-handling equipment.
  4. Weather-strip openings.
  5. Weather seal external opening at the end of each work day
- D. Preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

### 3.4 POLLUTION

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

### 3.5 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents

- of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations. Torch cutting or welding only permitted in staging area and other area designated by RE.
  - 5. Maintain adequate ventilation when using cutting torches.
  - 6. Remove decayed, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - 8. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 9. Dispose of demolished items and materials promptly.
  - 10. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Cut existing reinforcing 1/4-inch below finish surface. Do not over cut concrete or masonry openings.
- C. Removed and Salvaged Items
- 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to FAA.
  - 4. Transport items to FAA's storage area designated by RE.
  - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items
- 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  - 3. Protect items from damage during transport and storage.
  - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain - Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by RE, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

### 3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- D. Patch and repair floor and wall surfaces where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.
  - 1. Closely match texture and finish of existing adjacent surface.
  - 2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
  - 3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
  - 4. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - 5. Inspect and test patched areas to demonstrate integrity of the installation, where feasible.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General - Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. Coordinate removal from building and site with RE.
- B. Burning - Do not burn demolished materials.
- C. Disposal - Transport demolished materials off FAA's property and legally dispose of them.

### 3.8 CLEANING

- A. Sweep the building broom clean on completion of selective demolition operation.
- B. Change filters on air-handling equipment on completion of selective demolition operations.

**\* \* \* END OF SECTION 02070 \* \* \***

## SECTION 02085

### LEAD COATING WORK PRACTICES

#### PART 1 – GENERAL

##### 1.1 SUMMARY

Applicable provisions of Division 1 - General Requirements, Drawings, and other provisions and requirements of the Contract Documents apply to work of this Section.

- A. This Section includes the management-in-place, removal, containment, encapsulation, control and disposal of lead based paint or painted components. The work includes, but is not limited to: air monitoring during construction activities in areas where presence of lead sheeting and lead paint has been identified, the construction of temporary enclosures to isolate the work area, the establishment of negative-air pressure within the isolated work area, the removal of lead and lead based paints or painted components from the isolated work area, and the legal disposal of the removed lead and lead based paints from Government property, refer to Section 3.8 Work Levels for Determination of Work Practices.
- B. General Description of Work - Comply with the requirements of ANSI Z9.2, 29 CFR 1910.145, 29 CFR 1926.62 and 40 CFR 61 and 745. Typical sequence of the lead abatement work shall be as follows:
  - 1. Prepare the Work Area.
  - 2. Establish worker decontamination systems and a waste and equipment decontamination systems.
  - 3. Upon approval from the RE, initiate removal activities, cleaning and waste load-out.
  - 4. Perform final cleaning and initiate clearance testing.
  - 5. Restore work area to original conditions.

##### 1.2 REFERENCE DOCUMENTS

- A. American National Standards Institute (ANSI)
  - 1. Z9.2 Fundamentals Governing the Design and Operation of Local Exhaust Systems.
  - 2. Z41.1-1967 Safety Shoes
  - 3. Z87.1-1979 Protective Eye Wear
  - 4. Z88.2-1980 Practices for Respiratory Protection
  - 5. Z89.1-1981 Hard Hats
- B. American Society for Testing and Materials (ASTM)
  - 1. D2103 Polyethylene Film and Sheeting.
  - 2. E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

**C. Code of Federal Regulations (CFR)**

1. 29 CFR
  - Part 1910 Occupational Safety and Health Standard, General Industry.
  - 1910.132 Personal Protective Equipment.
  - 1910.134 Respiratory Protection.
  - 1910.141 Sanitation.
  - 1910.145 Specifications for Accident Prevention Signs and Tags.
  - 1910.1000 Air Contaminants.
  - 1910.1025 Lead.
  - 1910.1200 Hazard Communication.
2. Part 1926 Occupational Safety and Health Standards, Construction Industry.
  - Subpart D Occupational Health and Environmental Controls.
  - 1926.62 Lead Exposure In Construction.
3. 40 CFR
  - Part 61 National Emission Standards for Hazardous Air Pollutants.
  - Subpart A General Provisions
  - Part 260 Hazardous Waste Management System: General
  - Part 745 Lead; Requirements for Lead Based Paint Activities; Proposed Rule

**D. Department of Housing and Urban Development (HUD)**

1. HUD Lead Based Paint - Interim Guidelines for Hazard Identification and Abatement

**E. National Institute for Occupational Safety and Health (NIOSH). Department of Health and Human Services**

1. 7082 Atomic Absorption; Flame
2. 7105 Atomic Absorption; Graphite Furnace

**F. National Fire Protection Association (NFPA)**

1. 701 Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.

**G. Federal Aviation Administration (FAA) Orders**

1. Article 77 Agreement Between DOT/FAA and the national Air Traffic Controllers Association

**1.3 DEFINITIONS**

- A. ACRP - Abatement, Containment, and Removal Plan, submitted by the Contractor and subject to RE approval, clearly stating and scheduling the work, identifying the Levels of work required at each area, and identifying the safety, removal and disposal requirements for work at each area. ACRP shall include signs, labels and related warning devices for



identifying hazardous surfaces, areas and conditions to workers, occupants, and the general public.

- B. Immediately in this Section, the definition of this term shall be as follows: When the Contractor is on-site, immediately refers actions required to take place within 15 minutes of being notified. When the Contractor is off-site, immediately refers to actions required to take place within 2 hours of being notified.
- C. LAPM - Lead Abatement Project Manager
- D. LCC - Lead Containing Coatings - Paints or coatings that contain greater than or equal to 0.06% (600ppm) lead content by weight.

#### 1.4 PROJECT CONDITIONS

- A. Contractor Identification - The Contractor shall be licensed for the purpose of removal of lead sheeting and lead based paints on structures of facility components. Submit the following:
  - 1. Company name and address (street and mailing if different).
  - 2. Name of individual supplying information.
  - 3. Name of parent company, if any.
  - 4. Address of office responsible for this project.
  - 5. Telephone number.
- B. Insurance - Submit proof of insurance, including:
  - 1. Insurance carrier and coverage.
  - 2. Surety company.
  - 3. Special coverage specifically regarding lead.
- C. Staff - Submit the following information:
  - 1. Number of full-time company employees.
  - 2. Names of full-time field supervisory personnel, and years of lead removal experience.
  - 3. Names of part-time field supervisory personnel, and years of lead removal experience.
  - 4. Number of full-time laborers.
  - 5. Number of part-time laborers.
  - 6. Name of employees union, if any.
  - 7. Usual ratio of supervisory to labor personnel used.
- D. Experience
  - 1. Briefly describe company history.
  - 2. Provide evidence verifying that the company has successful lead abatement experience.

3. Provide a representative list of at least three successful lead abatement projects where work was performed in occupied environments, such as in hospitals or computer centers. List project name, date, size, duration, removal cost, references and telephone numbers for each project.
4. State average yearly dollar volume of lead removal work.

**E. Regulatory**

1. List and explain warnings or citations received from Federal, State or Local Regulatory Agencies related to previous lead abatement activities. Include project name, date and resolution.
2. List assessed penalties, liquidated damages, schedule overruns, and resolutions related to previous lead abatement activities. Include contract terminations.
3. List projects where removal activities were halted by the owner, architect or consultant. State project name, date, reason for shut-down and resolutions.
4. List lead-related legal proceedings and claims in which the Contractor, or employees scheduled to participate in this project, have participated or are currently involved. Include descriptions of role, issue and resolution to date.

**F. Medical Requirements (29 CFR 1910.1025/1926.62)**

1. Provide a copy of the company's Medical Surveillance Program.
2. Provide documentation from a physician that employees or agents who may be exposed to airborne lead particles in excess of background levels have been provided with an opportunity to be medically monitored to determine whether they are physically capable of working while wearing respirators and other PPE required without suffering adverse health effects. In addition, the Contractor shall document that personnel have received medical monitoring as required in OSHA 29 CFR 1926.62. This documentation shall be submitted for each employee entering the regulated (removal) area.

**G. Training**

1. Provide a copy of the company's training program for supervisors and laborers. The program shall include, but shall not be limited to, how often training is conducted, who conducts the training, when it is conducted, what the duration of the program is and how documentation of training is accomplished.
2. The Contractor shall submit certificates signed by each employee stating that each employee has received training in the proper handling of materials that contain lead; understands the health implications and risks involved including the illnesses possible from exposure to airborne lead particles; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of lead particles as related to health and respiratory equipment.

**H. Respiratory Protection**

1. Provide a copy of the company's respiratory protection training program.

- I. Health and Safety Program
  - 1. Provide a copy of the company's health and safety program.
- J. Project Personnel
  - 1. Provide number of full-time laborers that will be assigned to this project.
  - 2. Provide number of crews and shifts for this project.
- K. Abatement, Containment and Removal Plan (ACRP)
  - 1. The ACRP shall be developed by the Contractor, completed by a CIH, and approved by the RE. Modify ACRP as directed by the RE. Do not commence work until ACRP is approved by the RE.
  - 2. Level of work, work location, and emergency procedures shall be submitted in written and graphic form and prominently posted in the clean change area and equipment room of the worker decontamination area. Require workers to read and sign acknowledgment of ACRP prior to entering the work area. Provide explanation of contents to workers unable to understand the ACRP prior to obtaining signature of acknowledgment. Do not permit persons who do not understand and acknowledge requirements to enter work areas. ACRP shall describe the site layout, locations of emergency exits and emergency procedures. The Contractor shall review and designate containment area emergency exits in adequate number and location to provide safe and sufficient exits for workers. Exit layout and design shall provide primary priority to life safety and secondary priority to containment in the event of emergency conditions. The Contractor shall provide resultant decontamination.
- L. Licensing - Submit copies to the RE of notifications, Contractor's State License for Lead Removal, Hazardous Waste Manifest Form, and manufactures data on materials used at the site.
- M. Submittal Notarization - Sign and date submittal, indicating name and title of person signing.
- N. Transport and Disposal - Provide Federal, State and Local documentation regarding compliance with requirements for the transportation and disposal of lead containing material.
- O. Certification of Contractor - Certify that the Contractor is fully knowledgeable of lead abatement, containment, removal and safety procedures. Contractor shall certify acceptance of full responsibility for the health and safety of workers, occupants, Government employees, and users and visitors to the site.
- P. Accreditation of Laboratories - Submit copies that the laboratory to be used by the Abatement Contractor for Personnel Samples on this contract is accredited by the American Industrial Hygiene Association (AIHA) for lead testing.

- Q. The Contractor shall submit a detailed plan and schedule of the work procedures to be used in the removal of lead containing materials. The plan shall include:
1. A physical description of the work area;
  2. A detailed work area layout plan showing the location of temporary scaffolding, decking, access ladders, stairways, and elevators (interior & exterior);
  3. A layout of decontamination and bag-out chambers;
  4. A detail of the "Z-flap" construction;
  5. A description of the Level of Work (Level 1 or 2), including materials to be removed, and the approximate quantity, at each location;
  6. A description of the methods to be used to remove surfaces with the lead based paint;
  7. Interface of trades involved in the construction and sequencing of lead-removal and related work;
  8. A schedule for turning off and sealing existing ventilation systems, as needed;
  9. A description of work practices to be observed by employees;
  10. A description of personal protective equipment and clothing to be worn by employees;
  11. Personal hygiene procedures;
  12. Labeling and signage, including identification procedures;
  13. A description of the local exhaust ventilation systems to be used and air change calculations;
  14. A description of the method to be used to transport waste material;
  15. Location of the EPA approved landfill;
  16. An abatement schedule in time line format;
  17. A description of hazard signage text and graphics.
  18. Locations of signage, barriers, containment areas, clean areas, and other special rooms and areas required for proper completion of the work within OSHA and EPA requirements.

#### 1.5 PROJECT CONDITION AND COORDINATION

- A. Existing Conditions - Continuity of operations is essential to the safe operation of Air Traffic. The Contractor will be responsible for the allowing the continuous operation and protection of this facility, its occupants, its employees, and the public, and shall immediately notify the RE in the event of a breach of this protection regardless of magnitude or type. The Contractor shall coordinate construction and abatement activities with the RE in order to prevent disruption of this critical operation.
- B. The Government will occupy the buildings during construction activities. The Contractor shall cooperate fully with the RE during construction operations to minimize conflicts and to facilitate Government usage. The Contractor shall perform the work so as not to interfere with Government operations. The Contractor shall also provide Government personnel continuous access to equipment remaining in service.
- C. The work shall be limited to specific areas of the building and site. Unlimited access is specifically not permitted. Arrangements for use of the buildings and site will be restricted to those areas specifically allowed by Government. In the event other

Contractors will be working at the site prior to and after lead abatement, the Contractor shall cooperate with other Contractors and prevent work by others from jeopardizing the lead and lead paint removal work.

- D. Notification - The Contractor shall post lead related notifications and permits prior to and following abatement. Notify the RE ten (10) working days prior to the start of the lead removal operation.
- E. Hours of Work - The Contractor shall strictly adhere to work hours as identified in Division 1. Deviations shall be as pre-approved, in writing, by the RE at least 48 hours in advance.
- F. Change of Work Hours - Requests for change of work hours or overtime proposed by the Contractor shall be submitted in writing to the RE. Do not change work hours without obtaining prior written approval of the RE.

#### 1.6 WORK STOPPAGE

- A. The RE will immediately issue a "stop work" order to the Contractor if the safety of workers, Government personnel, or third parties is compromised, or for any of the following reasons:
  - 1. Lead air monitoring results indicate the presence of airborne lead particles to be greater than 30 ug/m<sup>3</sup> outside the containment.
  - 2. The pressure differential inside the containment varies more than 0.010 inches of water beyond the design pressure differentials specified.
  - 3. Excessive water accumulations appear or if water leakage or damage is detected in areas adjacent to the removal area.
  - 4. The work is found to violate specified requirements.

No work will be allowed to resume until the conditions are corrected by the Contractor and approval issued by the RE. Standby time required to identify and resolve the problem will be at the expense of the Contractor and shall include the costs incurred by the extended efforts of the LAPM.

#### 1.7 PRECONSTRUCTION MEETING

- A. The following items shall be included on the agenda for information provided by the Contractor and by the RE:
  - 1. Designation of responsible Contractor personnel for lead removal Work and designation of the LAPM.
  - 2. Establishing chain of authority.
  - 3. Tentative abatement schedule.
  - 4. Critical work sequencing and scheduling.
  - 5. Methods for processing field decisions and change orders.
  - 6. Resolutions of Requests for Information (RFI) based on contents of Contract Documents.
  - 7. Procedures affecting Applications for Payment.

**1.8 PROJECT CLOSEOUT SUBMITTAL**

- A. Upon completion of the work, the Contractor shall provide to the Government, through the LAPM, a closeout submittal. The closeout submittal will consist of the following documents:
  - 1. Written certification on final completion of the work that work complies with all aspects of contract documents; any items on substantial punch list have been completed or corrected and tools, construction equipment and surplus materials have been removed from the site.
  - 2. Contractor daily logs for abatement work.
  - 3. Contractor entry/exit logs for each containment.
  - 4. Copy of Waste Manifests for the project.
  - 5. Copies of worker and supervisory personnel certifications, fit test records and physicians written opinion forms specific for lead exposure.
  - 6. Copies of air monitoring results.

**1.9 QUALITY ASSURANCE**

- A. Quality Assurance/Quality Control (QA/QC):
  - 1. Provide a copy of the in-house specifications and procedures utilized by the Contractor as standard procedures. Include with ACRP.

**1.10 WORK BY GOVERNMENT**

- A. The following tasks shall be performed by the Government. Contractor shall coordinate work with these items at no additional cost to the Government.
  - 1. Independent environmental monitoring and sample analysis in addition to OSHA compliance monitoring performed by Contractor.
  - 2. The shut-down and re-start of mechanical equipment not provided as work of this project.
  - 3. The shut-down of electrical circuits and equipment not provided as work of this project.
  - 4. The removal and reinstallation of furniture, furnishings, and equipment prior to the start of work of this project in individual areas.

**PART 2 – MATERIAL**

**2.1 GENERAL**

- A. Materials and products shall comply with the requirements of 29 CFR 1910.134 and 29 CFR 1926.62.
- B. Polyethylene Sheeting - 6 mils thick, flame-retardant sheeting complying with ASTM D2103, with flammability requirements of NFPA 701, and with flame spread and smoke density requirements of ASTM E84.

- C. Duct Tape - Pressure-sensitive adhesive tape, minimum 3 mils thick by minimum 2 inches wide, water-proof.
- D. HEPA Filtered Vacuum - Vacuum(s) shall be capable of removing 99.97% of the lead particles, 0.3 microns or greater in diameter, from the air. Vacuums shall be portable and shall be equipped with hoses of sufficient length to reach areas behind pipes, ducts and other obstacles.
- E. HEPA Filtered Ventilation System - Portable ventilation system designed to exhaust and clean the air inside enclosed areas prior to exhausting to the outside of the building. The system shall be capable of filtering particles of 0.3 micron in size with an efficiency of 99.97%. Units used shall be equipped with automatic restart features.
- F. Encapsulant - Encapsulants, such as sealants, shall be compatible with existing surfaces and materials. Perform a test patch on all paints scheduled for encapsulation to verify adhesion and cohesion. Test patches shall be conducted according to manufacturer's recommendations.
- G. Worker Protection
  - 1. Personal Protective Equipment (PPE) - The Contractor is responsible for providing PPE for workers, Government representatives such as the RE, the LAPM, and authorized visitors. PPE shall include, but not be limited to, full body and head coverings, such as disposable coveralls, as well as full face PAPR. Respiratory protection shall comply with 29 CFR 1910.134 and 29 CFR 1926.62.
  - 2. Respirators - Personal protective breathing equipment shall be in accordance with 29 CFR 1910.134, 29 CFR 1910.1025 and 29 CFR 1926.62.
- H. Radio Communication - The Contractor shall furnish and maintain two-way radios for communication. The superintendent shall use these radios to maintain constant contact with the RE. An adequacy test of radios shall be conducted to verify clear, static-free communications throughout the building. The purpose of the adequacy tests shall be to maintain project control and to immediately communicate information relating to air monitoring results and pressure differential readings.
- I. Signs and Labels - Signs and labels shall be provided during lead paint abatement in accordance with 29 CFR 1910.145, 29 CFR 1910.1025, 29 CFR 1910.1200, 29 CFR 1926.62 and 40 CFR 745. Labeling at painted surfaces shall be provided in accordance with the ACRP. Labels shall designate areas where lead content greater than or equal to 600 ppm (0.06% by weight) occurs, with different labels provided at areas where lead content exists but is below 600 ppm. Include signage content, graphics, shape, and color of labels, and placement of labels in the ACRP. The ACRP will be approved by the RE.
- J. Disposal Bags - Leak-tight, 6 mil thick polyethylene bags with appropriate hazard warning, in accordance with EPA regulations 40 CFR 745 or and 29 CFR 1926.62.
- K. Miscellaneous Materials - The Contractor shall be responsible for all tangible supplies (such as coveralls, soap, shampoo and towels), for persons entering the removal area. This includes the FAA, APM and other persons approved for entry.



## PART 3 – EXECUTION

### 3.1 GENERAL

- A. The Contractor shall cooperate with the RE and the LAPM, including allowing access to the work areas for visual and air monitoring, collecting samples, providing requested data on personnel, equipment, scheduling, and other matters which facilitates Government's monitoring of the work.
- B. The Contractor shall not allow anyone access to the site who is not authorized by Government or the LAPM to enter the site of work.
- C. The Contractor shall provide sufficient personal protective equipment for two (2) authorized persons including full protective clothing and Powered Air Purifying Respirator (PAPR) with adequate filters required for the entire contract time without charge. The Contractor shall allow for full use of facilities by the LAPM and the RE at no additional Contract Sum or Contract Time.
- D. The Contractor shall maintain a log of persons who enter the work place. A record copy of logs shall be submitted to the LAPM on a weekly basis.
- E. Environmental Monitoring - Environmental monitoring for airborne particle concentrations and pressure differential will be accomplished by the LAPM, who will work under a separate contract with the Government. The LAPM will respond directly to the RE

### 3.2 EMERGENCY PLANNING AND PROCEDURES

- A. Emergency planning shall include written notification of police, fire and emergency medical personnel of planned abatement activities, work schedule, and layout of work area, particularly barriers that may affect response capabilities.
- B. Emergency planning shall include considerations of fire, explosion, toxic atmospheres, electrical hazards, slips, trips and falls, confined spaces and heat related injury. Written procedures shall be developed and employee training in procedures shall be provided.
- C. Employees shall be trained in evacuation procedures in the event of work place emergencies, including:
  - 1. For non-life threatening situations, employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the work place to obtain proper medical treatment.
  - 2. For life-threatening injury or illness, worker decontamination shall be secondary after measures to stabilize the injured worker, including removal from the work place and securing proper medical treatment.

3. Telephone numbers of emergency response personnel shall be prominently posted in the clean change area and equipment room, along with the location of the nearest telephone.

- D. Upon coordination with the RE, the Contractor shall clearly mark the exit paths within the enclosure for emergency egress. The Contractor shall use a fluorescent paint or tape and apply the markings no more than 24" above the floor surface.

### **3.3 HOUSEKEEPING**

- A. Essential aspects of lead dust control include housekeeping and clean-up procedures. Maintain surfaces within the lead control area free of accumulations of lead dust. Provide meticulous attention to restricting the spread of dust and debris. Prevent waste from being distributed or dispersed. Do not blow down the space with compressed air. The RE and LAPM reserve the right to inspect work areas daily for residual lead paint materials, and for accumulations of dust. The Contractor shall re-clean areas noted by the RE and by the LAPM.

### **3.4 LEAD ABATEMENT AND DISPOSAL SUPERINTENDENT**

- A. The Contractor shall designate a qualified employee as superintendent to perform/verify the following:
  1. Oversee workers performing lead related work.
  2. Oversee construction of enclosures, including the worker decontamination chamber and the waste load-out chamber.
  3. Control entry to, and exit from, the removal area.
  4. Supervise worker exposure monitoring required by OSHA and verify workers are properly trained and certified.
  5. Proper use of protective clothing and equipment.
  6. Occupants of the area where removal work is scheduled are properly informed and protected.
  7. Proper use of hygiene facilities and decontamination procedures.
  8. Engineering controls are functioning properly.
  9. Continuous floor and horizontal surface clean-up is performed.
  10. Continuous clean-up of lead paint debris is performed.
  11. Continuous collection and disposal of water build-up is performed. No puddling or ponding of water will be tolerated.
  12. Regular inspection of disposal procedures to verify conformance with the specification and with Federal, State and Local Laws.
  13. This individual shall have no other duties and shall be responsible for the daily removal of lead waste from the regulated area.
  14. Enforcement of work area entry and exit.
  15. Maintenance of enclosure systems.

### **3.5 ESTABLISHING NEGATIVE PRESSURE**

- A. Contractor shall establish negative pressure to the extent stated below. Each system for each Phase or area shall run, without failure, for a 24-hour period and be approved by the RE, in coordination with the LAPM, prior to the start of lead-removal related activity.

Pressure differentials throughout the lead removal work shall be monitored continuously by the Contractor and, at the Government's option, by the LAPM or by an independent Monitoring Contractor hired by, and under the direction of, the Government.

1. In the event of a loss of pressure to less than 0.010 inches of water gauge from the Design Pressure Differentials at any time of the day or night, for any reason, the Contractor shall immediately be called to the site to remedy the situation. Contractors shall be "on call" throughout the duration of the removal project on a 24-hour a day, 7-days a week basis. Failure to remedy the situation may result in back charges to the Contractor for the services rendered from an outside source. Furthermore, an acute loss of pressure could result in the evacuation of the control room, which would jeopardize the safety of the flying public.
2. The negative-air pressure shall be adjusted to meet the design pressure differential as indicated below and shall run continuously until final clearance is achieved. Once the Contractor has satisfied the pressure differential requirements, two (2) additional 2000 CFM negative-air units shall be set up to act as redundant elements, to be utilized in the event of equipment failure.
3. Definition of Zones - To verify the safety of the non-abatement environments inside and outside the ARTCC, the following Zones shall be established:

- a) ZONE I - Areas outside the lead removal area.
- b) ZONE II - The Lead Removal Area.

4. Design Pressure Differential Concept -

$$P_{\text{ZONE I}} > P_{\text{ZONE II}}$$

- a) The intent of this Design Concept is to prevent the contamination of non-abatement areas.

5. Design Pressure Differentials Inches of water gage

During Abatement Activities:

P<sub>ZONE I - ZONE I</sub>..... 0.05

During Off Hours:

P<sub>ZONE I - ZONE II</sub>.....0.03

6. Negative air units shall exhaust to the buildings exterior. Contractor shall be responsible for the restoration of the buildings to the preabatement condition after the completion of abatement.

### 3.6 DECONTAMINATION UNITS

- A. Worker Decontamination Unit - The Contractor shall provide a detailed plan of the decontamination chamber, including location, to the RE and to the LAPM for approval prior to beginning construction. Seal vertical and horizontal surfaces to establish critical barriers. The chambers shall be water-tight. Contractor shall be liable and responsible to the Government for leaks and damages occurring during the abatement activities. The

worker decontamination chamber shall consist of not less than a clean room, an airlock, a shower area, a second airlock and a dirty room. Provide lockers for each lead removal worker. Keep street clothing and street shoes in locker. While in removal area, only disposable protective clothing shall be worn. Reuse of protective clothing shall not be allowed nor will laundering be acceptable. Shoes and undergarments worn in the removal area shall not to be removed without being thoroughly cleaned in the shower first and then properly bagged. Locate showers between the decontamination room and the clean room. The shower shall be equipped with Contractor furnished hot and cold running water.

- B. Each person entering the removal area, for any length of time, shall shower upon exiting. Do not use the worker decontamination unit for equipment or waste decontamination. The door to the decontamination unit, on the clean side, shall be lockable. The Contractor shall provide the RE with two (2) keys to the lock, or the combination, as appropriate for the type of lock provided. The door will be locked during "off" hours.

### 3.7 EQUIPMENT AND WASTE DECONTAMINATION UNIT

- A. Provide a detailed plan of the proposed equipment and waste decontamination unit and location to the RE and the LAPM for approval prior to the beginning of construction. Seal vertical and horizontal surfaces. The unit shall be maintained water-tight. The equipment and waste decontamination unit shall include not less than a clean room, an airlock, a wash station, a second airlock and an equipment room. The unit shall provide a continuous closure from the building to the temporary storage unit. The unit shall be designed to be completely enclosed. When a vacuum type system is used, the Contractor shall install a 4 foot tall fence completely around the unit, creating a twenty (20') foot buffer zone between the unit and persons not involved in the work.
- B. Provide locking hardware for the door on the clean side of the bag out chamber. Provide the RE with two (2) keys to the lock, or the combination. Maintain the door in the locked position during "off" hours

### 3.8 WORK LEVELS

- A. At locations where LCC's are 0.06% or higher lead content, work shall be performed according to the following levels of work:
- B. Level 1 - The Contractor shall perform Level 1 work at lead painted surfaces by utilizing methods to prevent the formation, and the spread, of lead-containing dust, including wet cleaning and use of HEPA Filtered Vacuums. Level 1 work practices are not anticipated to exceed 30 ug/m<sup>3</sup> of airborne lead dust. HEPA Filtered Vacuums shall be located and operated to ensure no LCC shall affect the safety of workers, Government personnel, or third parties. Workers shall utilize applicable PPE. LAPM shall perform continuous air monitoring during these activities to verify that dust generated by LCC is prevented from migrating and to verify the safety of workers and occupants in areas where work is performed. Methods of penetrating surfaces and resultant requirements for dust control techniques, including prevention of dust migration and PPE requirements, shall be clearly identified in the ACRP as submitted by the Contractor and as approved by the

RE. The RE and LAPM must approve the Contractors written request to utilize Level 1 techniques prior to set up of the work area. Example pertains that the Contractor shall typically be permitted to perform using Level 1 dust control techniques include, but are not limited to:

1. Drilling, screwing, and fastening into lead-containing coatings (LCC);
2. Coring up to 2 inch diameter holes into CMU or into concrete surfaces;
3. Removing doors, including fire rated doors, from frames, when removal of LCC is not required;
4. Installing gypsum board over existing walls, including installing steel furring or framing;
5. Installing new walls perpendicular to existing wall surfaces using razor knife, wet sponge and wet sanding no more than a 6 inch wide area of existing LCC on each side of new wall;
6. Finishing activities using wet sponge, wet sanding or razor knife affecting not more than a 6 inch wide area of existing LCC on walls and floors;
7. Removing and installing metal railing systems with LCC, including systems where removal is by means of unbolting, unscrewing or unfastening railings from substrates to which they are attached;

C. Work Area Isolation and Safety Requirements in Level 1 Work Areas

1. Prepare the work areas. Post signs, labels and identification systems to warn workers, occupants and the public of presence of hazardous materials.
2. Limit access to authorized personnel and provide PPE to workers.
3. Provide continuous personal and area air monitoring.
4. Provide HEPA filtered vacuums for continuous use during execution of the work.
5. Comply with conditions established in approved ACRP.
6. Obtain approvals from RE and LAPM based on inspections of containment areas, including written certification of approval by the RE, prior to start of dust-generating work.
7. Obtain periodic inspections by the RE and the LAPM to verify continuous acceptability of safety controls. RE may conduct air testing and monitoring in addition to air testing and monitoring conducted by the Contractor.
8. Upon completion of removal, place unknown or hazardous materials in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums. All non-hazardous materials shall be sealed in two 6-mil clear plastic bags or wrapped in two layers of 6-mil plastic sheeting. Conduct final cleaning of the work areas.

D. Final Cleaning - Perform the following, as applicable, in areas of work requiring Level 1 work.

1. Remove and containerize visible accumulations of lead-containing material and lead-contaminated debris utilizing rubber dust pans and rubber squeegees. Do not use metal shovels to pick up or move accumulated waste.

2. Perform wet cleaning using a high-phosphate detergent mixture with rags, mops and sponges as appropriate for each condition as identified in ACRP. Be certain not to create excess water build-up or conditions resulting in water damage.
  3. Decontaminate tools and equipment.
  4. Remove the containerized waste from the work area.
  5. Inspect the work area for visible accumulation of dust. If dust is observed repeat cleaning process.
  6. Upon acceptance of the cleaned area by the RE and the LAPM, remove Contractor's equipment from the cleaned area as identified by the RE.
  7. Remove air monitoring equipment.
- E. Level 2 - Level 2 work practices anticipated to exceed 30 ug/m<sup>3</sup> of airborne lead dust. The Contractor shall perform Level 2 work on lead painted surfaces by utilizing lead containment procedures, including enclosure of work areas and other methods to prevent the formation, and spread of lead-containing dust. Work shall include isolating work areas by means of installing dustproof partitions of polyethylene sheet curtains, wetting of surfaces to be removed, and continuous use of HEPA Filtered Vacuums and Ventilation Systems. The LAPM shall perform continuous air monitoring during these activities to verify lead-containing dust does not migrate and to verify the safety of workers areas where work is performed. Methods of penetrating surfaces and resultant requirements for dust control techniques, including prevention of dust migration, shall be clearly identified in the Abatement, Containment and Removal Plan as submitted by the Contractor and as approved by the RE. The RE and LAPM must approve the Contractors written request to utilize Level 2 techniques prior to set up of the work area. Example operations that the Contractor shall typically perform using Level 2 dust control techniques include, but are not limited to, the following:
1. Coring holes greater than 2 inch diameter into CMU or concrete surfaces;
  2. Saw-cutting or otherwise creating openings in floor, wall, or ceiling surfaces with LCC;
  3. Removing door or window frames;
  4. Demolition work on LCC greater than 2' x 2'.
- F. Work Area Isolation and Safety Requirements in Level 2 Work Areas -
1. Prepare the work area. Post signs, labels and identification systems to warn workers, occupants and the public of presence of hazardous materials. Erect critical barriers with duct tape and two (2) layers of 6 mil plastic sheeting to prevent air movement out of the room or area where work is performed.
  2. Limit access to authorized personnel and provide PPE to workers. Install OSHA/EPA approved LEAD WARNING signs at the entrances to the work area.. Materials and equipment prone to water damage shall be sealed water tight with 6 mil plastic sheeting or shall be otherwise protected to prevent water contact.
  3. Construct worker decontamination chamber and equipment and waste decontamination chamber according to Section 02085-3.6.
  4. Establish negative pressure with HEPA filtered ventilation systems and exhaust units according to Section 02085-3.5. Negative pressure systems shall be vented



- to the outside of the buildings and shall not impede FAA's use of areas outside of containment areas.
5. Provide continuous personal and area air monitoring.
  6. Obtain approvals from RE and LAPM based on inspections of containment areas, including written certification of approval by the RE, prior to start of dust-generating work.
  7. Obtain periodic inspections by the RE and the LAPM to verify continuous acceptability of safety controls. RE may conduct air testing and monitoring in addition to air testing and monitoring conducted by the Contractor.
  8. Upon completion of removal work, place unknown or hazardous materials in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums. All non-hazardous materials shall be sealed in two 6-mil clear plastic bags or wrapped in two layers of 6-mil plastic sheeting. Conduct final cleaning of the work area.
  9. Upon acceptance of results of clearance testing, remove containment and decontamination chambers and conduct additional cleaning as directed by the RE.
- G. Final Cleaning - Perform the following, as applicable, at areas of work requiring Level 2 Work.
1. Remove and containerize visible accumulations of lead-containing material and lead-contaminated debris utilizing rubber dust pans and rubber squeegees. Do not use metal shovels to pick up or move accumulated waste.
  2. Perform wet cleaning using a high-phosphate detergent mixture with rags, mops and sponges as appropriate for each condition as identified in ACRP. Be certain not to create excess water build-up or conditions resulting in water damage.
  3. Doors, HVAC systems, vents and other openings shall remain sealed. The negative pressure ventilation units shall remain in continuous operation. Decontamination enclosure systems shall remain in place and be utilized.
  4. Remove containerized waste from the work area and waste container bag-out airlock.
  5. Decontaminate tools and equipment, and remove at the appropriate time in the cleaning sequence.
  6. After cleaning the work area, wait at least 24 hours to allow particles to settle. Vacuum the area with a HEPA filtration vacuum and wipe clean objects and surfaces in the work area after completion of the settlement period.
  7. Re-inspect the work area for visible residue. If accumulation of residue is observed, repeat the 24-hour settling period and cleaning cycle. Conduct Work based on standard lead abatement, collection, and disposal practices, including requirements specified.
  8. Upon acceptance of the cleaned area by the RE and the LAPM, reclean and remove Contractor's equipment located in the cleaned area as identified by the RE.
  9. After room or cleaned areas are dry, conduct visual inspection of all surfaces and areas. Reclean if visible residue is observed.
  10. Conduct final clearance testing as specified below. For Level 2, operate negative-air machines continuously until test results verify a "clean" environment.



11. Repeat settling and cleaning process, including clearance testing, until satisfactory results are achieved. Costs for all cleaning and testing shall be the responsibility of the Contractor. Recleaning and retest requirements shall not be the basis for additional Contract Sum or Contract Time.
12. Remove air monitoring equipment.

### 3.9 PROCEDURE FOR DISPOSAL

- A. Pending TCLP testing, collect lead waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing and place in sealed, impermeable 55 gallon drums. Properly label each drum including identification of the type of waste (40 CFR 178) and the date the drum was filled. The labeling shall include the following additional information:

FAA -SEATTLE ARTCC  
AUBURN, WASHINGTON

(NAME OF CONTRACTOR)

- B. The Contractor shall perform TCLP tests on the painted material being removed to determine if the material requires disposal as a hazardous waste or can be disposed of as a solid waste. If the Contractor opts not to run TCLP tests, the material shall be disposed of as hazardous wastes. Dispose of hazardous waste lead material at an Environmental Protection Agency (EPA) or state-approved hazardous waste treatment, storage, or disposal facility off Government property. Comply with land disposal restriction notification requirements as required by 40 CFR 268. An area for interim storage (less than 90 days) of lead waste-containing drums will be assigned by the Government. Procedure for hauling and disposal shall comply with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265, and with state, regional, and local standards.
- C. Waste manifests shall be signed by the Generator (Government), the Waste Transporter (Contractor) and the Approved Landfill (Disposal Facility).
- D. Minimum requirements for information included on the waste manifest include:
1. Contain a unique number based on regulatory requirements.
  2. Signature of Generator prior to shipping.
  3. Signature of Waste Transporter when material is picked-up from Site.
  4. Signature of Disposal Facility when received at Approved Landfill.
  5. Name and address of pick-up site.
  6. Estimated quantity of waste.
  7. Specific location within the building where waste was generated.
  8. Type and number of drums used at each specific location within the building.
  9. Name of Transporter.
  10. Disposal site name, location and EPA or State identification number.
  11. Copies of the manifests, signed by the Generator, Transporter and Disposal Facility, shall be maintained by each entity.
  12. The lead waste shipment shall be transported directly from the job site to the EPA approved hazardous waste facility. The Contractor shall notify the facility

of the date and time the lead waste will arrive at the facility. Costs incurred due to delays caused by the lead waste transporter, facility operator or Contractor, including failure to coordinate lead debris disposal, will be back-charged to the Contractor.

### 3.10 AIR MONITORING

- A. Personal Monitoring - The Contractor shall perform Personal Monitoring in accordance with specified requirements. An independent American Industrial Hygiene Association accredited laboratory shall be used to analyze air samples in accordance with OSHA Regulations 29 CFR 1910.1025 and 1926.62. Copies of the results of the air samples shall be furnished to the RE and LAPM within 72 hours following the day in which the samples were collected.
- B. Environmental Monitoring - Environmental monitoring for airborne lead particles and pressure differential shall be accomplished by a Certified Industrial Hygienist (CIH) or an air sampling technician supervised by a CIH. An independent accredited industrial hygiene laboratory shall be used to analyze air samples in accordance with OSHA Regulations 29 CFR 1910.1025 and 1926.62.
- C. LCC Work Monitoring - During work practices that involve disturbance of LCCs, the LAPM will collect one air sample at the worker decontamination chamber in the clean room, one air sample at the equipment and waste decontamination chamber in the clean room, one sample for each 50,000 cubic feet of air space (minimum of two samples) inside the work area and at least two samples outside the lead containment near the work area

### 3.11 LEVEL 2 CLEARANCE TESTING

- A. The Contractor shall notify the RE who in turn will notify the LAPM when the work areas are ready for clearance testing. The LAPM shall sample the surfaces in the work area for lead concentrations in accordance with HUD Guidelines for wipe sample collection.
  - 1. A minimum of 3 wipe samples shall be taken in the abatement work area and analyzed. The samples shall be taken randomly throughout the containment area, including window sills, window wells, and floors. Samples shall be required to pass clearance levels as set by HUD guidelines or state law which ever is more stringent. If clearance samples are above the clearance level the area will be recleaned and retested.

\* \* \* END OF SECTION \* \* \*

**DIVISION 3**

**CONCRETE**

**SECTION 03100**

**CONCRETE FORMWORK**

**PART 1 – GENERAL**

**1.1 SCOPE**

The Subcontractor shall provide all labor, equipment, and materials as required to locate and place concrete forms as specified herein and on the project drawings.

**PART 2 – MATERIAL**

**2.1 FORMS**

Forms shall be wood, plywood, metal, engineered form systems or other approved material. All form materials shall be of the grade or type suitable to obtain the kind of finish specified.

**2.2 FORM TIES**

Form Ties shall be fixed band type or threaded internal disconnecting type with a working load suitable to prevent deformation of forms. They shall be of a type that allows no metal closer to the surface than 1½ inches for steel ties and 1 inch for stainless steel ties. Twisted wire ties shall not be permitted.

**2.3 FORM OIL**

Form Oil shall be non-staining and shall not cause softening of the concrete or impede the wetting of surfaces to be cured with water or curing compounds.

**PART 3 – EXECUTION**

**3.1 PLACEMENT**

Formwork shall be placed only after inspection, testing, and approval of excavated areas and embedded items by the RE. Forms shall result in a final structure that does not exceed  $\pm \frac{1}{2}$  inch variation in any dimension shown on the applicable drawings. Form joints shall be sufficiently tight to prevent leakage of mortar. Form oils shall be placed on forms or form ties and shall be removed from reinforcing steel or conduits if accidentally applied to such.

**3.2 CURING**

In hot, dry climates, wood forms remaining in place shall not be considered adequate curing, but shall be loosened so that the concrete surfaces may be cured in accordance with Section 03300.

**3.3 REMOVAL**

Forms shall be removed no less than 3 days after the concrete placement operation has been completed, provided 50°F ambient temperatures have been maintained. Wood forms may be

loosened within 12 to 24 hours after the placement operation if such action will not damage or deform the concrete structure and provided that care is exercised to ensure that concrete curing is accomplished as specified in Section 03300.

**\* \* \* END OF SECTION \* \* \***

**SECTION 03200**

**CONCRETE REINFORCEMENT**

**PART 1 – GENERAL**

**1.1 SCOPE**

The Subcontractor shall provide the necessary labor, material, and equipment for the placement of steel reinforcement as specified herein and shown on the applicable drawings.

**1.2 APPLICABLE PUBLICATIONS**

The following specifications and standards of the issues currently in force, form a part of this section and are applicable as specified herein.

- A. American Society for Testing and Materials (ASTM) Publication
- B. ASTM A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- C. American Concrete Institute (ACI) Standards -
- D. ACI 315 Details and Detailing of Concrete Reinforcement.

**PART 2 – MATERIAL**

**2.1 REINFORCING STEEL**

Reinforcing Steel shall conform to ASTM A 615, grade 60.

**2.2 SURFACES**

Surfaces shall be free of mud, oil, or other nonmetallic coatings which may affect bonding quality. Mill scale or rust remaining after hand brushing with a wire brush is permissible.

**2.3 BENDING**

All bends in bars and ties shall be cold bent. No bends shall be made in bars or ties partially embedded in concrete.

**2.4 HOOKS**

Hooks shall be 180° hooks. The bend diameter as measured on the inside of the bar shall not be less than 6 bar diameters for bars and not less than 1½ inches for ties.

**2.5 TIE WIRE, CHAIRS, AND SPACERS**

All devices necessary to properly space, support and fasten steel reinforcement in place during concrete placement shall conform to ACI 315. Tie wire shall be 16 gauge or larger annealed iron wire.

**PART 3 – EXECUTION**

**3.1 PLACEMENT**

Steel reinforcement shall be accurately spaced and in the sizes indicated on the applicable drawings and secured against displacement during concrete placement operations. Reinforcement shall be placed within  $\pm \frac{1}{2}$  inch of the indicated dimensions and shall maintain 3" clearance in all directions.

**3.2 EMBEDDED ITEMS**

Embedded items, conduit, etc. shall be set level and in their proper positions and shall be securely anchored to the forms prior to placing concrete. Field verify that all dimensions are correct.

**PART 4 – QUALITY ASSURANCE**

**4.1 MILL CERTIFICATION**

Mill Certification of steel compliance with ASTM A 615 shall be submitted to the WRPE designee at the time of delivery. The certificate shall be signed by the Subcontractor, and shall include the project name and location, and the quantity and delivery date to which the certificate applies.

**4.2 SUBMITTALS**

Submittals required include, but are not necessarily limited to, the following:

A. Rebar Mill Certification.

**\* \* \* END OF SECTION \* \* \***



**SECTION 03300**

**CAST-IN-PLACE LIGHT WEIGHT CONCRETE**

**PART 1 – GENERAL**

**1.1 SCOPE**

- A. This Section specifies cast-in place concrete, reinforcing, mix design, placement procedures, and finishes.
- B. Cast-in-place concrete includes the following:
  - 1. Fill for steel deck
  - 2. Equipment bases
  - 3. Concrete surface repairs

**1.2 APPLICABLE PUBLICATIONS**

The following specifications and standards of the issues currently in force, form a part of this section and are applicable as specified herein.

American Society for Testing and Materials (ASTM) Publications

- 1. A185 - Specification for Steel Wire, Plain, for Concrete Reinforcement.
- 2. C31 - Test Method of making and Curing Concrete Test Specimens in the Field.
- 3. C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- 4. C42 - Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- 5. C94 - Specification for Ready-Mixed Concrete.
- 6. C143 - Test Method for Slump of Hydraulic Cement Concrete.
- 7. C150 - Specification for Portland Cement.
- 8. C172 - Practice for Sampling Freshly Mixed Concrete.
- 9. C173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- 10. C231 - Test Method for Air content of Freshly Mixed Concrete by the Pressure Method.
- 11. C260 - Specification for Air-Entraining Admixtures for Concrete.
- 12. C330 - Specification for Lightweight Aggregates for Structural Concrete.
- 13. C494 - Specification for Chemical Admixtures for Concrete.
- 14. C567 - Standard Test Method for Unit Weight of Structural Lightweight Concrete.
- 15. C1064 - Test Method for Temperature of Freshly Mixed Portland-Cement Concrete.
- 16. E329 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

American Concrete Institute (ACI) Standards

1. Manual of Concrete Practice.
- B. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
  2. ACI 318, "Building Code Requirements for Reinforced Concrete."
  3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- C. Concrete Testing Service: Engage a testing agency qualified in accordance with ASTM E329

### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
  1. Avoid damaging coatings on steel reinforcement

## PART 2 – MATERIAL

### 2.1 REINFORCING MATERIALS

- A. Welded Wire Fabric - ASTM A 185, welded steel wire fabric.
- B. Supports for Reinforcement - Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

### 2.2 CONCRETE MATERIALS

- A. Portland Cement - ASTM C 150, Type I.
  1. Use one brand of cement throughout Project unless otherwise acceptable to the RE.
- B. Lightweight Aggregates - ASTM C 330.
- C. Water - Potable.
- D. Admixtures, General - Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- E. Air-Entraining Admixture - ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products - Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  - a) Air-Mix or Perma-Air, Euclid Chemical Co.
  - b) Darex AEA or Daravair, W.R. Grace & Co.
  - c) MB-VR or Micro-Air, Master Builders, Inc.
  - d) Sika AER, Sika Corp.
- F. Water-Reducing Admixture - ASTM C 494, Type A.
  1. Available Products - Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
    - a) Eucon WR-75, Euclid Chemical Co.
    - b) WRDA, W.R. Grace & Co.
    - c) Pozzolith Normal or Polyheed, Master Builders, Inc.
    - d) Plastocrete 161, Sika Corp.
- G. Water-Reducing, Accelerating Admixture - ASTM C 494, Type E.
  1. Available Products - Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
    - a) Accelguard 80, Euclid Chemical Co.
    - b) Daraset, W.R. Grace & Co.
    - c) Pozzutec 20, Master Builders, Inc.
- H. Water-Reducing, Retarding Admixture - ASTM C 494, Type D.
  1. Available Products - Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
    - a) Eucon Retarder 75, Euclid Chemical Co.
    - b) Daratard-17, W.R. Grace & Co.
    - c) Pozzolith R, Master Builders, Inc.
    - d) Plastiment, Sika Corporation.

## 2.3 CURING MATERIALS

- A. Evaporation Retarder - Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover - AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz/sq. yd. dry.
- C. Moisture-Retaining Cover - ASTM C171, polyethylene film or white burlap-polyethylene sheet.

- D. Water - Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound - ASTM C309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound - ASTM C1315, Type 1, Class A.

## **2.4 PROPORTIONING AND DESIGNING MIXES**

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to RE for preparing and reporting proposed mix designs.
  - 1. Do not use the same testing agency for field quality control testing.
- B. Submit written reports to RE of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by RE.
- C. Lightweight Structural Concrete - Lightweight aggregate and concrete shall conform to ASTM C 330. Proportion mix to produce concrete with a minimum compressive strength of 3,000 psi and a calculated equilibrium unit weight of 110 pcf plus or minus 3 pcf as determined by ASTM C 567. Concrete slump at the point of placement shall be the minimum necessary for efficient mixing, placing, and finishing. Maximum slump shall be 6 inches for pumped concrete and 5 inches elsewhere.

## **2.5 ADMIXTURES**

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
- B. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

## **2.6 CONCRETE MIXING**

- A. Job-Site Mixing - Mix concrete materials in appropriate drum-type batch machine mixer. For mixers of 1 cu. yd. or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than 1 cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional 1 cu. yd.
  - 1. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- B. Ready-Mixed Concrete - Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## 2.7 NON-SHRINK GROUT

- A. Non-shrink Grout shall be in accordance with ASTM C 1107, Grade A. Mixing and installation shall be as recommended by the manufacturer.

## PART 3 – EXECUTION

### 3.1 GENERAL

Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

### 3.2 CONCRETE PLACEMENT

- A. Inspection - Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General - Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Hot-Weather Placement - When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
  1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
  3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
  4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to RE.

- E. Cold Weather Placement - Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

### 3.3 FINISHING FLOORS AND SLABS

- A. General - Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish - Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing.
- C. Trowel Finish - After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
  - 2. Finish and measure surface so gap at any point between concrete surface and an unveled freestanding 10-foot- long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/4 inch.

### 3.4 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In - Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

- B. Equipment Bases and Foundations - Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

### 3.5 CONCRETE CURING AND PROTECTION

- A. General - Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods - Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Use continuous water-fog spray.
  - 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4 inch lap over adjacent absorptive covers.
- E. Provide moisture-retaining cover curing as follows:
  - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- F. Curing Unformed Surfaces - Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
  - 1. Final cure concrete surfaces to receive finish flooring with a moisture retaining cover, unless otherwise directed.

### 3.6 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas - Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to RE.



- B. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
  - 1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
  - 2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching.
- C. Repairing Unformed Surfaces - Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
  - 1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, pop outs, honeycombs, rock pockets, and other objectionable conditions.
  - 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
  - 3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to RE.
  - 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- D. Repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs with prior approval of RE for method and procedure, using specified epoxy adhesive and mortar.

- F. Repair methods not specified above may be used, subject to acceptance of RE.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency - Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services - Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
1. Testing Frequency - Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
    - a) When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump - ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
  3. Air Content - ASTM C231, pressure method, for normal-weight concrete; ASTM C173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  4. Concrete Temperature - ASTM C1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  5. Unit Weight - ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  6. Compression Test Specimens - ASTM C31 cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
    - a) Cast and field cure one set of four standard cylinder specimens for each composite sample.
  7. Compressive-Strength Tests - ASTM C39; test two laboratory-cured specimens at 7 days and two at 28 days.
    - a) Test two field-cured specimens at 7 days and two at 28 days.
    - b) A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- E. Test results shall be reported in writing to Project Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted by Architect but shall not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests - Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by RE.

#### PART 4 – QUALITY ASSURANCE

- A. Codes and Standards - Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
  - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
  - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Testing Service - Engage a testing agency qualified in accordance with ASTM E329
- C. Installer Qualifications - An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications - A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- E. Testing Agency Qualifications - An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.
  1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- F. Source Limitations - Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- G. Welding - Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- H. ACI Publications - Comply with the following, unless more stringent provisions are indicated:
  1. ACI 301, "Specification for Structural Concrete."
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- I. Testing Waived

The tests can be waived when all of the conditions are met:

- a) Concrete placement of less than 10 cubic yards.
- b) The required 28-day compressive strength is 3000 psi or less.
- c) The concrete mix is a standard proven design for the ready-mix plant and has been reviewed and approved by FAA in advance. Delivery tickets as described above shall be provided.
- d) Visual inspection of the concrete as it is delivered and placed indicates that it has satisfactory slump, cement content and workability. Concrete that appears to fail any of these criteria shall be rejected and immediately removed from the site.

#### 4.1 REPAIR OR REPLACEMENT

- A. The Contractor shall restore concrete damaged by work under this contract to its original condition as directed by the Resident Engineer. The Resident Engineer may reject any and all concrete not meeting slump or air entrainment requirements. Any concrete not meeting strength requirements shall be removed and replaced by the Contractor at his expense. Any repair or replacement costs shall be paid by the Contractor.

#### 4.2 SUBMITTALS

Product Data - For each type of manufactured material and product indicated.

- A. Design Mixes - For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mix water to be withheld for later addition at Project site.
- B. Steel Reinforcement Shop Drawings - Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- C. Material Test Reports - From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials.
- D. Material Certificates - Signed by manufacturers certifying that each of the following items complies with requirements:
  - 1. Cementitious materials and aggregates.
  - 2. Form materials and form-release agents.
  - 3. Steel reinforcement and reinforcement accessories.
  - 4. Admixtures.
  - 5. Curing materials.
  - 6. Bonding agents.
  - 7. Repair materials.

**\* \* \* END OF SECTION \* \* \***

# **DIVISION 5**

## **METALS**

## SECTION 05120 - STRUCTURAL STEEL

### PART 1 - GENERAL

#### 1.1. SUMMARY

- A. This Section includes structural steel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Quality Control" for independent testing agency procedures and administrative requirements.
  - 2. Section 05500, "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
  - 3. Section 09900, "Painting," for surface preparation and priming requirements for field painting.

#### 1.2 REFERENCE STANDARDS

- A. American Institute of Steel Construction (AISC)
- B. American Society for Testing and Materials
  - 1. A 36 Specification for Steel Castings, Carbon, for General Application.
  - 2. A 307 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 3. A 325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi minimum Tensile Strength.
  - 4. A 490 Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
  - 5. A 500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 6. E 94 Guide for Radiographic Testing.
  - 7. E 142 Method for Controlling Quality of Radiographic Testing.
  - 8. E 164 Practice for Ultrasonic Contact Examination of Weldments.
  - 9. E 165 Test Method for Liquid Penetrant Examination.
  - 10. E 709 Guide for Magnetic Particle Examination.
  - 11. F 959 Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
- C. American Welding Society (AWS)
  - 1. D1.1 Structural Welding Code Steel.
- D. Steel Structures Painting Council
  - 1. SP 6 Surface Preparation Specification No. 6: Commercial Blast Cleaning.

#### 1.3 PERFORMANCE REQUIREMENTS



- A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loading indicated.
- B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

#### 1.4 SUBMITTALS

- A. Product Data for each type of product specified.
- B. Shop Drawings detailing fabrication of structural steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
- C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
  - 1. Structural steel, including chemical and physical properties.
  - 2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
  - 3. Direct-tension indicators.
  - 4. Shop primers.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
  - 1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
    - a. Category: Category I, conventional steel structures.
    - b. Fabricator shall be registered with and approved by authorities having jurisdiction.

- C. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
  - 2. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
  - 3. AISC's "Seismic Provisions for Structural Steel Buildings."
  - 4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."
  - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
  - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

#### 1.7 SEQUENCING

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

##### STRUCTURAL STEEL

- A. Structural Steel Shapes, Plates, and Bars: As follows:
    - 1. Carbon Steel: ASTM A 36 (ASTM A 36M).
  - B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.
  - C. Anchor Rods, Bolts, Nuts, and Washers: As follows:
    - 1. Unheaded Rods: ASTM A 36 (ASTM A 36M).
    - 2. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts.
    - 3. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
    - 4. Headed Bolts: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
    - 5. Washers: ASTM A 36 (ASTM A 36M).
  - D. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
    - 1. Finish: Plain, uncoated.
  - E. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
    - 1. Finish: Plain, uncoated.
    - 2. Direct-Tension Indicators: ASTM F 959, Type 325.
      - a. Finish: Plain, uncoated.
  - F. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.
    - 1. Direct-Tension Indicators: ASTM F 959, Type 490, uncoated.
  - G. Welding Electrodes: Comply with AWS requirements.
- 2.2 PRIMER
- A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.
- 2.3 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
  - 1. Mark and match-mark materials for field assembly.
  - 2. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
  - 3. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
  - 4. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded.
- C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- D. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
  - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
  - 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

## 2.4 SHOP CONNECTIONS

- A. Shop installs and tightens high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

## 2.5 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces to be field welded.
  - 2. Surfaces to receive sprayed-on fireproofing.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
  - 1. SSPC-SP 6 "Commercial Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

## 2.6 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
  1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
  2. Provide testing agency with access to places where structural steel work is being fabricated or produced so required inspection and testing can be accomplished.
- B. Correct deficiencies in
  1. Liquid Penetrant Inspection: ASTM E 165.
  2. Magnetic Particle or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- E. In addition to visual inspection, a minimum of 10 percent of shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
  1. Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  2. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
  3. Ultrasonic Inspection: ASTM E 164.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection.
- F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - 1. Bolts: [ASTM A 325](#) ([ASTM A 325M](#)) high-strength bolts, unless otherwise indicated.
  - 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
  - 3. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.
- B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - 1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

### 3.5 FIELD QUALITY CONTROL

- A. Contractor will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - 1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
  - 1. Liquid Penetrant Inspection: ASTM E 165.
  - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
  - 4. Ultrasonic Inspection: ASTM E 164.

### 3.6 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
  - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

END OF SECTION 05120



**SECTION 05400 - COLD-FORMED METAL FRAMING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Interior framing conditions for drywall conditions not specified in Section 09255 "Gypsum Board Assemblies."
  - 2. Exterior sheathing and air-infiltration barriers.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 05500 "Metal Fabrications" for masonry shelf angles and connections.
  - 2. Section 09255 "Gypsum Board Assemblies" for gypsum board and non-load-bearing metal-stud framing assemblies.

**1.2 REFERENCE STANDARDS**

- A. American Iron and Steel Institute (AISI)
- B. American Welding Society (AWS)
  - 1. D1.1 Structural Welding Code Steel.
  - 2. D1.3 Structural Welding Code Sheet Steel.
- C. American Society for Testing and Materials (ASTM)
  - 1. A 36 Specification for Structural Steel.
  - 2. A 123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. A 153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 4. A 307 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 5. A 446 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip process, Structural (Physical) Quality.
  - 6. A 525 Specification for General Requirements for Steel Sheet, Zinc-Coat (Galvanized) by the Hot-Dip Process.
  - 7. A 780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - 8. C 150 Specification for Portland Cement.
  - 9. C404 Specification for Aggregates for Masonry Grout.
  - 10. C 665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - 11. C 1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
  - 12. E 119 Method for Fire Tests of Building Construction and Materials.
  - 13. E 488 Test Methods for Strength of Anchors in Concrete and Masonry Elements.

14. E 699 Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee.

D. Department of Defense (DOD)

1. P-21035 Paint, High Zinc Dust Content, Galvanizing Repair.

E. Steel Structures Painting Council (SSPC)

1. 20 Paint Specification No. 20 Zinc-Rich Primers (Type I, "Inorganic," and Type "Organic").

1.3 PERFORMANCE REQUIREMENTS

- A. AISI "Specifications": Calculate structural characteristics of cold-formed metal framing according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members" and the following:
- B. AISI "Specifications": Calculate structural characteristics of cold-formed metal framing according to AISI's "Load and Resistance Factor Design Specification for Cold-Formed Steel Structural Members" and the following:
  1. Center for Cold-Formed Steel Structures (CCFSS) Technical Bulletin, Vol. 2, No. 1, February 1993 "AISI Specification Provisions for Screw Connections."
- C. Structural Performance: Engineer, fabricate and erect cold-formed metal framing with the following minimum physical and structural properties:
  1. Physical and Structural Properties: As indicated.
- D. Structural Performance: Engineer, fabricates, and erects cold-formed metal framing to withstand design loads within limits and under conditions required.
  1. Design Loads: As indicated.
  2. Design framing systems to withstand design loads without deflections greater than the following:
    - a. Interior Non-load-Bearing Curtain-wall: Lateral deflection of 1/240 of the wall height at 5 psf wind load.
    - b. Exterior Non-load-Bearing Curtain-wall: Lateral deflection of 1/600 of the wall height at 30 psf wind load.
  3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F.
  4. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

- E. Design exterior non-load-bearing curtain-wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.
- F. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

#### **1.4 SUBMITTALS**

- A. Product data for each type of cold-formed metal framing, accessory, and product specified.
- B. Shop drawings showing layout, spacings, sizes, thickness, and types of cold-formed metal framing, fabrication, fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachments to other units of Work.
  - 1. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.
- C. Mill certificates signed by manufacturers of cold-formed metal framing certifying that their products comply with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized-coating thickness.
  - 1. In lieu of mill certificates, submit test reports from a qualified independent testing agency evidencing compliance with requirements.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product test reports from a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing:
  - 1. Expansion anchors.
  - 2. Powder-actuated anchors.
  - 3. Mechanical fasteners.
- G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence cold-formed metal framing's compliance with building code in effect for Project.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to COR's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- D. Fire-Test-Response Characteristics: Where fire-resistance-rated assemblies are indicated, provide cold-formed metal framing identical to that tested as part of an assembly for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Professional Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of cold-formed metal framing similar to this Project in material, design, and extent and that have a record of successful in-service performance.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Known Acceptable Source: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated in the work include, but are not limited to, Clark-Cincinnati, Inc.

### 2.2 MATERIALS

- A. Galvanized-Steel Sheet: [ASTM A 446](#) zinc coated according to [ASTM A 525](#) and as follows:

1. Coating Designation, Interior Walls: G 60.
2. Coating Designation, Exterior Walls: G 90.
3. Grade: As required by structural performance.

## **2.3 WALL FRAMING**

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with the following:
  1. Design Uncoated-Steel Thickness: 0.0747 inch (14 gage)
  2. Flange Width: 2 inches
  3. Web: Punched.
- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
  1. Design Uncoated-Steel Thickness: Matching steel studs.
  2. Flange Width: Manufacturers standard deep flange where indicated, standard flange elsewhere.

## **2.4 FRAMING ACCESSORIES**

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with minimum yield strength of 33,000 psi.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  1. Supplementary framing.
  2. Bracing, bridging, and solid blocking.
  3. Web stiffeners.
  4. Gusset plates.
  5. Deflection track and vertical slide clips.
  6. Stud kickers and grits.
  7. Joist hangers and end closures.
  8. Reinforcement plates.

## **2.5 ANCHORS, CLIPS, AND FASTENERS**

- A. Steel Shapes and Clips: ASTM A 36 zinc coated by the hot-dip process according to ASTM A 123.
- B. Cast-in-Place Anchor Bolts and Studs: ASTM A 307, Grade A; carbon-steel hex-head bolts and studs; carbon-steel nuts; and flat, unhardened-steel washers. Zinc coated by the hot-dip process according to ASTM A 153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

- D. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

## **2.6 MISCELLANEOUS MATERIALS**

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, non-corrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and a 30-minute working time.
- D. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

## **2.7 FABRICATION**

- A. Fabricate cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
  - 1. Fabricate framing assemblies in jig templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
  - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to manufacturer's recommendations.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.
- C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of **1/8 inch in 10 feet** and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions affecting performance of cold-formed metal framing. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Before sprayed-on fireproofing is applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed-on fireproofing.
- B. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of cold-formed framing without reducing thickness of fireproofing below that required to obtain fire-resistance rating indicated. Protect remaining fireproofing from damage.
- C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

#### **3.3 INSTALLATION, GENERAL**

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
  1. Cut framing members by sawing or shearing; do not torch cut.
  2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.



- D. Provide temporary bracing and leave in place until framing is permanently stabilized.
- E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- F. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible upon completion of framing work.
- G. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.
- H. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of **1/8 inch in 10 feet** and as follows:
  - 1. Space individual framing members no more than plus or minus **1/8 inch** from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: A qualified independent testing agency employed and paid by Government will perform field quality-control testing.
- B. Field and shop welds will be subject to inspection and testing.
- C. Testing agency will report test results promptly and in writing to Contractor and COR.
- D. Remove and replace Work that does not comply with specified requirements.
- E. Additional testing will be performed to determine compliance of corrected work with specified requirements.

### **3.5 REPAIRS AND PROTECTION**

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing.
  - 1. Touchup painted surfaces with same type of shop paint used on adjacent surfaces.
- C. Protect sheathing that will be exposed to weather for more than one month as follows:
  - 1. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at the time sheathing is applied.

- D. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer to ensure that cold-formed metal framing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following metal fabrications:
1. Rough hardware.
  2. Ladders.
  3. Ship ladder.
  4. Loose bearing and leveling plates.
  5. Loose steel lintels.
  6. Floor Grating Platforms.
  7. Miscellaneous framing and supports for the following:
    - a. Suspended toilet partitions.
    - b. Suspended operable partitions.
    - c. Applications where framing and supports are not specified in other sections.
  8. Miscellaneous steel trim, including the following:
    - a. Interior steel stair components.
  9. Steel pipe handrails attached to walls adjacent to metal stairs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 05120 "Structural Steel" for structural steel framing system components.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
1. A 14.3. Ladders fixed Safety Requirements
  2. B 18.2.1. Square and Hex Bolts and Screws Inch series; Supplement.
  3. B 18.6.1. Wood Screws inch series.
  4. B 18.6.3. Machine Screws and Machine Screws Nuts.
  5. B 18.21.1 Lock Washers inch series.
  6. B 18.22.1 Plain Washers Reaffirmation and Redesignation.
- B. American Society for Testing and Materials (ASTM)
1. A 27 Specification for Steel Castings, Carbon for General Application.
  2. A 36 Specification for Carbon Structural Steel.
  3. A 47 Specification for Ferritic Malleable Iron Castings.
  4. A 48 Specification for Gray Iron Castings.
  5. A 123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. A 153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 7.A 307 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- 8.A 500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
9. A 501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
10. A 563 Specification for Carbon and Alloy Steel Nuts.
11. A 780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
12. A 786 Specification for Rolled Steel Floor Plates.
14. B 633 Specification for Electro-deposited Coatings of Zinc on Iron and Steel.
15. C 1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
16. E 488 Test Method for Strength of Anchors in Concrete and Masonry Elements.
17. F 593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
18. F 594 Specification for Stainless Steel Nut.

C. American Welding Society (AWS)

- 1.D1.1 Structural Welding Code - Steel.
- 2.D1.2 Structural Welding Code - Aluminum.
- 3.D1.3 Structural Welding Code - Sheet Steel.

D. Federal Specifications (FS)

1. FS FF-B-588 Bolt, Toggle, and Expansion Sleeve, Screw.
2. FS TT-P-664 Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant.

E. Steel Structures Painting Council (SSPC)

1. PA 1 Paint Application Specification No. 1 Shop, Field, and Maintenance Painting.
2. PA 3 Paint Application Guide No. 3 Guide of Safety in Paint Application.
3. PA 6 Qualification Procedures.
4. Paint 12 Paint Specification No. 12 Cold applied Asphalt Mastic (Extra Thick Film).
5. Paint 20 Paint Specification No. 20 Zinc-Rich Primers (Type I "Inorganic," and Type II "Organic").

F. National Association of Architectural Metal Manufacturers (NAAMM)

1.3 SUBMITTALS

- A. Product data for nonslip aggregates and nonslip aggregate surface finishes, prefabricated building columns, cast nosings, treads and thresholds, steel floor plate, paint products, and grout.
- B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show

anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

- C. Samples representative of materials and finished products as requested by COR.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

#### 1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

### PART 2 - PRODUCTS

#### 2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: [ASTM A 36](#).
- C. Rolled Steel Floor Plates: [ASTM A 786](#).

- D. Steel Tubing: Product type (manufacturing method) and as follows:
  - 1. Cold-Formed Steel Tubing: ASTM A 500.
  - 2. Hot-Formed Steel Tubing: ASTM A 501.
    - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
- E. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
  - 1. Black finish, unless otherwise indicated.
  - 2. Galvanized finish for exterior installations and where indicated.
- F. Gray-Iron Castings: ASTM A 48, Class 30.
- G. Malleable-Iron Castings: [ASTM A 47, Grade 32510](#).
- H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Threaded or wedge type; galvanized ferrous castings, either [ASTM A 47](#) malleable iron or [ASTM A 27](#) cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- I. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

## 2.2 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

## 2.3 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro-deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

- B. Bolts and Nuts: Regular hexagon-head bolts, [ASTM A 307](#), [Grade A](#), with hex nuts, [ASTM A 563](#) and, where indicated, flat washers.
- C. Machine Screws: [ANSI B18.6.3](#).
- D. Lag Bolts: [ANSI B18.2.1](#).
- E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.
- F. Plain Washers: Round, carbon steel, [ANSI B18.22.1](#).
- G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
  - 1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with [ASTM F 593](#) and [ASTM F 594](#).
- I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

## 2.4 GROUT

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Known Acceptable Source: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Non-shrink, Nonmetallic Grouts: Kemset; The Spray-Cure Company.

## 2.5 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design



calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 100 deg F.

- D. Shear and punch metals cleanly and accurately. Remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.
- K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

## 2.6 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

## 2.7 STEEL LADDERS

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorage's as indicated. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous, steel, 1/2-by-2-1/2-inch flat bars, with eased edges, spaced 18 inches apart.
- C. Bar Rungs: 3/4-inch-diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 60 inches o.c. with welded or bolted steel brackets.
  - 1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
  - 2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
- F. Provide nonslip surfaces on top of each rung, either by coating the rung with aluminum-oxide granules set in epoxy-resin adhesive, or by using a type of manufactured rung that is filled with aluminum-oxide grout.
- G. Galvanize ladders, including brackets and fasteners, in the following locations:
  - 1. Exterior locations.
  - 2. Interior locations where indicated.

## 2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

## 2.9 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.

- D. Galvanize loose steel lintels located in exterior walls.

## 2.10 FLOOR GRATING PLATFORMS

- A. Form to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual for Steel, Stainless Steel, and Aluminum Gratings and Stair Treads:
  - 1. Fabricate platforms from steel grating as indicated.
  - 2. Surface: Plain
  - 3. Finish: Primed, as fabricated
- B. Structural Performance: Provide floor grating platforms capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.
  - 1. Platforms: Capable of withstanding a uniform live load of 40 lb/sq. ft.
  - 2. Limit deflection of platforms to 1/4 inch.

## 2.11 SHELF AND RELIEVING ANGLES

- A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support shelf/relieving angles from back-up masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity wall exterior wythe.
- C. Galvanize shelf angles to be installed on exterior concrete framing.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

## 2.12 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
  - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
    - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by

8 inches long.

- C. Fabricate support for suspended toilet partitions as follows:
  - 1. Beams: Continuous steel shapes of size required to limit deflection to L/360 between hangers, but use not less than C8 by 11.5 channels or another shape with equivalent structural properties.
  - 2. Hangers: Steel rods, 1/2-inch minimum diameter, spaced not more than 36 inches o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge-shaped washers for full bearing on sloping flanges of support beam.
  - 3. Braces and Angles: Steel angles of size required for rigid support of beam and for secure anchorage.
- D. Galvanize miscellaneous framing and supports in the following locations:
  - 1. Exterior locations.
  - 2. Interior locations where indicated.

## 2.13 FLOOR PLATE

- A. Fabricate raised-pattern floor plates from rolled-steel floor plate of thickness and in pattern indicated below:
  - 1. Thickness: As indicated.
  - 2. Pattern: As selected from manufacturer's standard patterns.

## 2.14 STEEL PIPE HANDRAILS AND RAILING SYSTEMS

- A. General: Fabricate pipe handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.
- B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
  - 1. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to which end is joined, and weld all around.
- C. Form changes in direction of handrails and rails as follows:
  - 1. By welding in prefabricated flush elbow fittings.
  - 2. By radius bends of radius indicated.
  - 3. By flush radius bends.
  - 4. By bending.
  - 5. By any method indicated above, applicable to change of direction involved.
- D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

- E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
- F. Close exposed ends of pipe by welding 3/16-inch-thick steel plate in place or with prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.
- G. Fabricate newels of steel tubing and provide newel caps of pressed steel, as shown.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of handrails and railing systems to other work. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work.
  - 1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.
- I. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.
- J. For galvanized handrails and railing systems, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- K. For nongalvanized steel handrails and railing systems, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

## 2.15 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
- B. Finish metal fabrications after assembly. Pre-finish metal items prior to installation, and field touch-up after installation.

## 2.16 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
  - 1. ASTM A 153 for galvanizing iron and steel hardware.
  - 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."

2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Coordinate and furnish anchorage's, setting drawings, diagrams, templates, instructions, and directions for installing anchorage's, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

### 3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in form-work for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

### 3.3 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
  - 1. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 INSTALLING STEEL PIPE RAILINGS AND HANDRAILS

- A. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
  - 1. Anchor posts to steel by welding directly to steel supporting members.
  - 2. Anchor handrail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with drilled-in expansion anchors.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with **1-1/2-inch** clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:
  - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
  - 2. Use type of bracket with predrilled hole for exposed bolt anchorage.
  - 3. For concrete and solid masonry anchorage, use drilled-in expansion anchor.
  - 4. For hollow masonry anchorage, use toggle bolts having square heads.
  - 5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

### 3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a **2.0-mil** minimum dry film thickness.
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.



END OF SECTION 05500

## **DIVISION 6**

### **WOOD AND PLASTICS**

SECTION 06105 - MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Rooftop equipment bases and support curbs.
2. Wood furring, grounds, nailers, and blocking.
3. Interior wood trim.
4. Shelving and clothes rods.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 06402 "Interior Architectural Woodwork" for interior woodwork not specified in this Section.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. A 153 Zinc-Coating (Hot-Dip) of Iron and Steel Hardware.
2. A 307 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
3. A 563 Specification for Carbon and Alloy Steel Nuts.

B. American Wood Preservers' Association (AWPA)

1. C 2 Lumber, Timbers, Bridge Ties and Mine Ties, Pressure Treatment.
2. C 9 Plywood, Pressure Treatment.
3. C 20 Structural Lumber, Fire-Retardant Pressure Treatment.
4. C 27 Plywood, Fire-Retardant Pressure Treatment.
5. M 4 Standard for the Care of Preservative-Treated Wood Products.

C. Council of American Building Officials (CABO)

1. NER-272 Pneumatic or Mechanically Driven Staples, Nails, P-Nails and Allied Fasteners for Use in All Types of Building Construction.

D. Department of Commerce (DOC)

1. PS 20 American Softwood Lumber Standard.

E. Federal Specification (FS)

1. FF-N-105 Nails, Brads, Staples and Spikes: Wire, Cut and Wrought.

F. National Lumber Grades Authority (NLGA)

- G. Underwriters Laboratories Inc. (UL)
- H. Southern Pine Inspection Bureau (SPIB)
- I. Western Wood Products Association (WWPA)

### 1.3 SUBMITTALS

- A. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
  - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
  - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
  - 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.
- B. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with performance requirements indicated.
- C. Warranty of chemical treatment manufacturer for each type of treatment.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
  - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

## PART 2 - PRODUCTS

### 2.1 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NELMA - Northeastern Lumber Manufacturers Association.
  - 2. NLGA - National Lumber Grades Authority (Canadian).

3. RIS - Redwood Inspection Service.
  4. SPIB - Southern Pine Inspection Bureau.
  5. WCLIB - West Coast Lumber Inspection Bureau.
  6. WWPA - Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece.
- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
1. Provide dressed lumber, S4S, unless otherwise indicated.
  2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

## 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPAC2 (lumber) and AWPAC9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
1. Do not use chemicals containing chromium or arsenic.
  2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb./cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- C. Pressure treat wood members in contact with ground with waterborne preservatives to a minimum retention of 0.40 lb./cu. ft.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Fire-retardant-treated wood is to be used for all interior work. Fire-retardant-treated wood is to comply with applicable requirements of AWPAC20 (lumber) and AWPAC27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL;

U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Treatment Types: Interior Type A for interior wood and Exterior for wood exposed to weather.

- B. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

## 2.4 BOARDS

- A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:

1. Moisture Content: 19 percent maximum.
2. Species and Grade: Southern pine, C Finish per SPIB rules.

- B. Concealed Boards: Where boards will be concealed by other work, provide lumber with 19 percent maximum moisture content and of following species and grade:

1. Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.

## 2.5 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

## 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

- B. Nails, Wire, Brads, and Staples: FS FF-N-105.

- C. Power-Driven Fasteners: CABO NER-272.

- D. Bolts: Steel bolts complying with [ASTM A 307, Grade A](#); with [ASTM A 563](#) hex nuts and, where indicated, flat washers.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- F. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
- G. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

#### 3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install where shown and where required for screeding or attaching other work. Cut and shape to required size. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION 06105



SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Plastic-laminate countertops.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 06105 "Miscellaneous Carpentry" for typical carpentry work.

1.2 REFERENCE STANDARDS

- A. American Hardboard Association (AHA)
  - 1. A135.4 Basic Hardboard.
- B. American National Standards Institute (ANSI)
  - 1. A 208.1 Wood Particleboard.
  - 2. A 208.2 Medium Density.
- C. American Society for Testing and Materials (ASTM)
  - 1. E 84 Test Method for Surface Burning Characteristics of Building Materials.
- D. American Society of Mechanical Engineers (ASME)
  - 1. B 18.6.1 Wood Screws (Inch Series).
- E. American Wood Preservers Association (AWPA)
  - 1. C 20 Structural Lumber - Fire-Retardant Treatment by Pressure Processes.
- F. Architectural Woodwork Institute (AWI)
- G. Federal Specifications (FS)
  - 1. FF-N-105 Nails, Brads, Staples, and Spikes: Wire, Cut and Wrought.
- H. Hardwood Plywood and Veneer Association (HPVA)
  - 1. HP-1 Interim Voluntary Standard for Hardwood and Decorative Plywood.
- G. National Electrical Manufacturers Association (NEMA)

1. LD 3 High Pressure Decorative Laminates.

J. Underwriters Laboratories Inc. (UL)

### 1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

### 1.4 SUBMITTALS

- A. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- B. Fire-retardant-treatment data for material treated to reduce combustibility. Include certification by treating plant that treated materials comply with requirements.
- C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  1. Show details full size.
  2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
  3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
- D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
  1. Plastic laminates.
- E. Samples for verification of the following:
  1. Laminate-clad panel products, **8 by 10 inches**, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
- F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

### 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

- B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.
- C. Quality Standard: Except as otherwise indicated, comply with the following standard:
  - 1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
    - a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.
  - 2. The Contract Documents contain selections chosen from options in the Quality Standard as well as additional requirements beyond those of the Quality Standard. Comply with such selections and requirements in addition to the Quality Standard.
- D. Fire-Test-Response Characteristics: Provide materials with the following fire-test-response characteristics as determined by testing identical products per ASTM test method indicated below by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify fire-retardant-treated material with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
  - 1. Surface-Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for 30 minutes with no evidence of significant combustion. In addition, the flame front shall not progress more than 10-1/2 feet beyond the center line of the burner at any time during the test.
    - a. Flame Spread: 25.
    - b. Smoke Developed: 450.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.
- B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

- B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
  - 2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

## 1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
  - 1. Hardboard: AHA A135.4.
  - 2. Medium-Density Fiberboard: ANSI A208.2.
  - 3. Particleboard: ANSI A208.1, Grade M-2.
  - 4. Hardwood Plywood and Face Veneers: HPVA HP-1.
- C. Fiberboard: Medium-density fiberboard made without formaldehyde and complying with ANSI A208.2.
  - 1. Known Acceptable Source: Subject to compliance with requirements, provide Medite II by Medite Corp.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
  - 1. Known Acceptable Source: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated in the Work include, but are not limited to, Formica Corporation.
- E. Adhesive for Bonding Plastic Laminate: Contact cement.

### 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Fire-retardant-treated wood is to be used for all interior work. Fire-retardant-treated wood is to comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
  - 1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
  - 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
  - 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Fire-Retardant Chemicals: Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- D. Fire-Retardant Particleboard, Veneer Faced Panels: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve products identical to those tested for flame spread of 25 or less and for smoke developed of 25 or less per ASTM E 84 by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.
  - 1. For panels 3/4 inch thick and less and 45-lb./cu. ft density, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 lbf and 225 lbf respectively.
  - 2. For panels 13/16 to 1-1/4 inches thick and 44-lb./cu. ft density, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 lbf and 175 lbf respectively.
  - 3. Known Acceptable Source: Subject to compliance with requirements, provide Duraflake FR by Willamette Industries, Inc.
- E. Fire-Retardant Fiberboard at Plastic Laminate Fabrications: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve products identical to those tested for flame spread of 25 or less and for smoke developed of 200 or less per ASTM E 84 by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having

jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

1. Known Acceptable Source: Subject to compliance with requirements, provide Medite FR by Medite Corp.

## 2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
  1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.
- C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

## 2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
  1. Grade: Custom.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

- E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

## 2.5 COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for countertops.
- B. Type of Top: High-pressure decorative laminate complying with the following:
  - 1. Grade: GP-50, 0.050-inch nominal thickness.
  - 2. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as selected by COR.
  - 3. Edge Treatment: Same as laminate cladding on horizontal surfaces.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

### 3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches for plumb and level (including tops).
- C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- E. Tops: Anchor securely to support systems as indicated. Caulk space between back-splash and wall with specified sealant.
  - 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  - 2. Secure back-splashes to tops with concealed metal brackets at 16 inches o.c.



3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 06402

## **DIVISION 7**

# **THERMAL & MOISTURE PROTECTION**

## SECTION 07210 - BUILDING INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Insulation Types required for this Project include the following, as identified on the Drawings:
  - 1. Insulation Type 1: 3-1/2 inch glass fiber batt insulation.
  - 2. Insulation Type 2: 3-1/2 inch sound attenuation insulation, specified in Section 09255 "Gypsum Board Assemblies".
  - 3. Insulation Type 3: Safing Insulation.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 09255 "Gypsum Board Assemblies" for insulation installed as part of metal-framed wall and partition assemblies.

#### 1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. C 553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - 2. C 612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
  - 3. E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 4. E 119 Standard Test Method for Fire Test of Building Construction and Materials.
  - 5. E 136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 deg C.

#### 1.3 SUBMITTALS

- A. Product Data for each type of insulation product specified.
- B. Samples for verification of each type of exposed insulation facer.
- C. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.
- D. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of foam-plastic insulation's with building code in effect for Project.

#### 1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Fire-Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Known Acceptable Sources: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
  - 1. Glass Fiber Insulation 3-1/2 inch batt at Insulation Type 1: Foil Faced Thermal Batt Insulation by Owens Corning Fiberglas Corporation.
  - 2. Insulation Type 2: Refer to Section 09255.
  - 3. Safing Insulation: Thermafiber by USG.

### 2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thickness, widths, and lengths.
- B. Unfaced, Flexible Glass-Fiber Board Insulation: Thermal insulation combining glass fibers with thermosetting resin binders to comply with ASTM C 612, Type IA; or with ASTM C 553, Types I, II, and III; and with other requirements indicated below:
  - 1. Nominal Density: Not less than 1.5 lb./cu. ft. nor more than 1.65 lb./cu. ft.
  - 2. Thermal Resistivity: 4.13 deg F x h x sq. ft./Btu x in. at 75 deg F.
  - 3. Surface-Burning Characteristics: Smoke-developed indices of 25 and 50, respectively.

- C. Foil-Faced, Flexible Glass-Fiber Board Insulation: Thermal insulation combining glass fibers with thermosetting resin binders and faced on one side with foil-scrim-Kraft vapor retarder to comply with ASTM C 612, Type IA; or with ASTM C 553, Types I, II, and III; and with other requirements indicated below:
  - 1. Nominal Density: 1.5 lb./cu. ft..
  - 2. Thermal Resistivity: 4.13 deg F x h x sq. ft./Btu x in. at 75 deg F.
  - 3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

## 2.3 SAFING INSULATION AND ACCESSORIES

- A. Slag-Wool-Fiber Board Safing Insulation: Semi-rigid boards designed for use as fire stop at openings between edge of slab and exterior wall panels, produced by combining slag-wool fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; nominal density of 4 lb./cu. ft.; passing ASTM E 136 for combustion characteristics; thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.
- B. Caulking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.
- C. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

## 2.4 VAPOR RETARDER TAPE

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

## 2.5 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Protection Board: Premolded, semi-rigid asphalt/fiber composition board, 1/4 inch thick, formed under heat and pressure, standard sizes.

## 2.6 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation, of thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:
  - 1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - 2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches in diameter, length to suit depth of insulation indicated.

- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
  - 1. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
- D. Known Acceptable Sources: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Adhesively Attached, Spindle-Type Anchors:
    - a. TACTOO Insul-Hangers; AGM Industries, Inc.
  - 2. Insulation-Retaining Washers:
    - a. RC150; AGM Industries, Inc.
    - b. SC150; AGM Industries, Inc.
  - 3. Anchor Adhesives:
    - a. TACTOO Adhesive; AGM Industries, Inc.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation's or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

#### 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

- D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

### 3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for fire-stopping.
  - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Set reflective, foil-faced units with not less than 0.75-inch air space in front of foil as indicated.
- E. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
  - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Place blankets in between parapet wall framing to prevent condensation in the planum area.

### 3.5 INSTALLATION OF SAFING INSULATION

- A. Install safing insulation to fill gap between edge of concrete floor slab and back of exterior spandrel panels on safing clips spaced as needed to support insulation, but not further apart than 24 inches o.c. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of slab with caulking approved by safing insulation manufacturer for this purpose. Leave no voids in completed installation.

### 3.6 PROTECTION

- A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.



END OF SECTION 07210

SECTION 07220-ROOF INSULATION

PART 1 - GENERAL

1.1 SCOPE

Requirements included - Contractor shall be responsible for all cutting, fitting and patching, required to complete the work or to:

- A. Remove and replace defective work.
- B. Remove and replace work not conforming to requirements

1.2 REFERENCE DOCUMENTS

The following specifications and standards of the issues currently in force, form a part of this section and are applicable as specified herein.

- A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
  - 1. ANSI A208.1 (1989) Wood Particleboard
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  - 1. ASTM C 208 (1972; R 1982) Insulating Board (Cellulosic Fiber), Structural and Decorative
  - 2. ASTM C 552 (1991) Cellular Glass Thermal Insulation
  - 3. ASTM C 578 (1992) Rigid, Cellular Polystyrene Thermal Insulation
  - 4. ASTM C 726 (1988) Mineral Fiber Roof Insulation Board
  - 5. ASTM C 728 (1991) Perlite Thermal Insulation Board
  - 6. ASTM C 984 (1983) Perlite Board and Rigid Cellular Polyurethane Composite Roof Insulation
  - 7. ASTM C 1050(1991) Rigid Cellular Polystyrene Cellulosic Fiber Composite
- C. FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)
  - 1. FM P7825 (1992) Supple I, II & III) Approval Guide
- D. UNDERWRITERS LABORATORIES (UL)
  - 1. UL-01 (1992) Building Materials Directory Structural Performance

1.3 SUBMITTALS

Submittals required include, but are not necessarily limited to, the following:

- A. Instructions - Application of Insulation - Insulation manufacturer's recommendations for the application and installation of insulation.
- B. Inspection - The inspection procedure for insulation installation, prior to start of roof insulation work.

- C. Certificates - Insulation - Certificate attesting that the expanded perlite or polyisocyanurate insulation contains recovered material and showing estimated percent of recovered material.

#### 1.4 RELATED REQUIREMENTS

- A. Section 07545 - TPO Thermoplastic Single-Ply Roofing
- B. Section 07600 - Flashing and Sheet Metal

### PART 2 – MATERIAL

#### 2.1 INSULATION

- A. Insulation shall be a standard product of the manufacturer and shall be factory marked with the manufacturer's name or trade mark, the material specification number, the R-value at 24 degrees C, (75 degrees F,) and the thickness. Minimum thickness shall be as recommended by the manufacturer. Boards shall be marked individually. The thermal resistance of insulation shall be not less than the R-30. Insulation and fiberboard shall contain the highest practicable percentage of material which has been recovered or diverted from solid waste, but not including material reused in a manufacturing process. Where 2 materials have the same price and performance, the one having the higher recovered material content shall be selected. Insulation shall be one, or a combination of the following materials:
  - 1. Cellular Glass - ASTM C 552, Type IV.
  - 2. Composite Board Insulation - ASTM C 726, or ASTM C 984 or ASTM C 1050. Perlite,
  - 3. in composite board, may be replaced with ANSI A208.1 wood particle board, 11 mm (7/16-inch) minimum thickness, provided that the composite board meets specified physical requirements.
  - 4. Expanded-Perlite Insulation Board - ASTM C 728 with a minimum recovered material content of 23 percent of the expanded perlite portion of the board.
  - 5. Fiberboard - ASTM C 208, roof insulating board, treated with sizing, wax or bituminous impregnation.
  - 6. Mineral-Fiber Insulation Board - ASTM C 726.
- B. Foam Insulation - ASTM C578-87a for pre-formed cellular polystyrene insulation. FS HH-I-1972/1 for polyurethane or polyisocyanurate insulation.

#### 2.2 FASTENERS

- A. Fasteners shall conform to the following requirements:
  - 1. Fasteners - Insulation manufacturer's recommendations and shall be spaced to withstand an uplift pressure of 90 pounds per square foot.
  - 2. Metal Disks - Flat and not less than 30 gauge thickness. Disks used with fasteners for securing insulation shall be minimum 3 inches in diameter or as approved by manufacturer.
  - 3. Nails shall not be used.

PART 3 – EXECUTION

3.1 COORDINATION REQUIREMENTS

Insulation and roofing membrane shall be finished in 1 operation up to the line of termination at the end of each day's work. Completed sections shall be waterproofed when more than 1 day is required to finish the roofing. Phased construction will not be permitted.

3.2 ENVIRONMENTAL CONDITIONS

Air temperature shall be above 40 degrees F and there shall be no visible ice, frost, or moisture on the roof deck when the insulation and roofing are installed.

3.3 SUBSTRATE PREPARATION

A. Steel Deck

1. Metal decks shall be a minimum uncoated thickness of 16 gauge (to match existing) and shall have a G-90 galvanized finish on all panels.
2. Decks shall comply with the gauge and span requirements in the current Factory Mutual FM Approval Guide and be installed in accordance with Loss Prevention Data Sheet 1-28 or specific FM approval.
3. When re-roofing over steel decks, surface corrosion shall be removed, and repairs to severely corroded areas made. Loose or inadequately secured decking shall be fastened, and irreparable or otherwise defective decking shall be replaced.
4. With retrofit roof applications, it is required that the deck be inspected for defects. Defects are to be corrected per the deck manufacturer's recommendations prior to the roofing application.

3.4 INSULATION - GENERAL

- A. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. Before the application of the insulation, any damage or deterioration to the vapor retarder shall be repaired.
- B. Do not install wet, damaged or warped insulation boards.
- C. Install insulation boards with staggered board joints in one direction (unless taping joint).
- D. Install insulation boards snug. Gaps between board joints shall not exceed 1/4 inch (6 mm). All gaps in excess of 1/4 inch (6 mm) shall be filled with like insulation material.
- E. Wood nailers shall be 3-1/2 inches (89 mm) minimum width or 1 inch (25 mm) wider than metal flange. They shall be of equal thickness as the insulation with a minimum 1 inch (25 mm) thickness. All nailers shall be securely fastened to the deck.
- F. Do not kick insulation boards into place.
- G. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.

- H. Roof tape, if required over insulation joints, shall be laid evenly, smoothly and embedded in a uniform coating of hot steep asphalt with 4 inches (102 mm) end laps. Care shall be taken to assure smooth application of tape, and full embedment of the tape in the asphalt.
- I. Do not install any more insulation than will be completely waterproofed each day

### 3.5 INSULATION - BASE LAYER

- A. The insulation shall be securely attached to the roof deck.
- B. Use only fasteners with a minimum 3 inch (76 mm) stress plate when mechanically attaching insulation. Do not attach insulation with nails.

### 3.6 INSULATION - SUBSEQUENT LAYERS

- A. The insulation shall be securely attached to the roof deck.
- B. Multiple layers of insulation of the same, non-tapered insulation material may be simultaneously mechanically fastened with approved fasteners and plates through the top layer of insulation to the structural deck. Individual layers of insulation shall not exceed 3 inches (76 mm) in thickness nor total thickness of all layers shall not exceed 5 inches (127 mm).
- C. Use only fasteners with a minimum 3 inch (76 mm) stress plate when mechanically attaching insulation. Do not attach insulation with nails.

### 3.7 INSPECTION

- A. The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roof insulation with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:
  - 1. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.
  - 2. Verification of certification, listing or label compliance with FMP7825.
  - 3. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.
  - 4. Inspection of vapor retarder application, including edge envelopes and mechanical fastening.
  - 5. Inspection of mechanical fasteners; type, number, length, and spacing.
  - 6. Coordination with other materials, cants, sleepers, and nailing strips.
  - 7. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.
  - 8. Installation of cutoffs and proper joining of work on subsequent days.
  - 9. Continuation of complete roofing system installation to cover insulation installed same day.

**PART 4 – QUALITY ASSURANCE**

**4.1 STORAGE OF MATERIALS**

Insulation, base sheet, and felt shall be kept dry at all times, before, during, and after delivery to the site and shall be stored in an enclosed building or in a closed trailer. Wet insulation, wet base sheet or wet felt shall be permanently removed from the site.

**4.2 FIRE CLASSIFICATION**

Insulation shall have been tested as part of a roof construction assembly of the type used in this project and the construction shall be listed as Fire-Classified in UL-01 or Class I in FM P7825.

END OF SECTION 07220

SECTION 07251 - SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Concealed sprayed-on fireproofing.
  - 2. Exposed sprayed-on fireproofing.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 05120 "Structural Steel" for surface conditions specified for structural steel receiving sprayed-on fireproofing.
  - 2. Section 07270 "Fire-Stopping" for through-penetration fire-stop systems.

1.2 REFERENCE STANDARDS

- A. American Standard for Testing and Materials (ASTM)
  - 1. E 84 Test Method for Surface Burning Characteristics of Building Materials.
  - 2. E 119 Test Methods for Fire Tests of Building Construction and Materials.
  - 3. E 605 Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members.
  - 4. E 699 Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.
  - 5. E 736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
  - 6. E 759 Test Method for Effect of Deflection of Sprayed Fire-Resistive Material Applied to Structural Members.
  - 7. E 76 Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members.
  - 8. E 859 Test Method for Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members.
  - 9. E 937 Test Method for Corrosion of steel by Sprayed Fire-Resistive Material Applied to Structural Members.
- B. Association of Wall and Ceiling Industries, International (AWCI)
  - 1. A12 Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials; An Annotated Guide. 2d ed.
- C. Environmental Protection Agency (EPA)
  - 1. CFR 40 Asbestos Hazardous Emergency Response Act, Friable Asbestos-Containing Materials in Schools.



- D. Underwriters Laboratories, Inc. (UL)

### 1.3 DEFINITIONS

- A. Concealed sprayed-on fireproofing refers to applications where sprayed-on materials are applied to surfaces that are concealed from view behind other construction when the Work is completed.
- B. Exposed sprayed-on fireproofing refers to applications where sprayed-on materials are applied to surfaces that are exposed to view when the work is completed.

### 1.4 SUBMITTALS

- A. Product data for each sprayed-on fireproofing product indicated.
  - 1. Certification by manufacturers that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Shop drawings in form of structural framing plans indicating the following:
  - 1. Where and what kinds of surface preparations are required before applying fireproofing.
  - 2. Extent of sprayed-on fireproofing for each different construction and fire-resistance rating including the following:
    - a. Applicable fire-resistive design designations of inspecting and testing agency acceptable to authorities having jurisdiction.
    - b. Minimum thickness' needed to achieve required fire-resistance ratings of structural components and assemblies.
    - c. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3 as determined by a qualified professional engineer.
  - 3. Treatment of fireproofing after its application.
- C. Test reports for sprayed-on fireproofing from a qualified independent testing agency employed and paid by Contractor or manufacturer. Provide reports indicating that physical properties of proposed sprayed-on fireproofing products comply with specified requirements based on comprehensive testing of current product formulations according to the following requirements:
  - 1. Testing is performed on sprayed-on fireproofing materials randomly selected from bags bearing the applicable classification marking of UL or another inspecting and testing agency acceptable to authorities having jurisdiction.
  - 2. Testing is performed on specimens of sprayed-on fireproofing materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical in every respect to installed fireproofing including application of sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
  - 3. Qualified independent testing agency does testing on laboratory specimens that it witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
    - a. Test reports without the above information are not acceptable.

- D. Product certificates from fireproofing manufacturers that each sprayed-on fireproofing product indicated for project complies with specified requirements including those for fire-test-response characteristics and compatibility with adhesives, primers, and other surface coatings on substrates indicated to receive fireproofing.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of architects and owners, and other information specified.
- F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction showing that sprayed-on fireproofing products comply with building code in effect for Project.

#### 1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide sprayed-on fireproofing products identical to those used in assemblies tested for the following fire-test-response characteristics, per test method indicated below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify packages (bags) containing fireproofing with appropriate classification markings of applicable testing and inspecting agency.
  - 1. Fire-Resistance Ratings: As indicated by reference to fire-resistive designs listed in UL "Fire Resistance Directory," or in the comparable publication of another testing and inspecting agency acceptable to authorities having jurisdiction, for fire-resistive assemblies where sprayed-on fireproofing serves as direct-applied protection, tested per ASTM E 119.
  - 2. Surface-Burning Characteristics: As indicated for each sprayed-on fireproofing product required, tested per ASTM E 84.
- B. Installer Qualifications: Engage an experienced Installer certified, licensed, or otherwise qualified by the sprayed-on fireproofing manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its sprayed-on fireproofing products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- C. Single-Source Responsibility: Obtain sprayed-on fireproofing materials from a single manufacturer for each different product required.
- D. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing structural engineering services of the kind indicated that have resulted in the installation of structural systems similar to this Project in material, design, and extent with a record of successful in-service performance.
- E. Provide fireproofing products containing no detectable asbestos as determined according to the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.
- B. Use materials with limited shelf life within period indicated. Remove from Project site and discard any materials whose shelf life has expired.
- C. Store sprayed-on fireproofing materials inside, under cover, above ground, so they are kept dry until ready for use. Remove from Project site and discard any materials that have deteriorated.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40 deg F and falling, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after applying sprayed-on fireproofing.
- B. Ventilation: Ventilate sprayed-on fireproofing by natural means or, where this is inadequate, forced-air circulation during and after application until fireproofing dries thoroughly.

1.8 SEQUENCING

- A. Sequence and coordinate application of sprayed-on fireproofing with other related work specified in other Sections to comply with the following requirements:
  - 1. Provide temporary enclosures to prevent deterioration of sprayed-on fireproofing for interior applications due to exposure to unfavorable environmental conditions.
  - 2. Avoid unnecessary exposure of sprayed-on fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.
  - 3. Do not apply fireproofing to metal roof decking substrates until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.
  - 4. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
  - 5. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until fireproofing is installed.
  - 6. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, tested, and corrections have been made to any defective fireproofing.

1.9 WARRANTY

- A. General: The warranty specified in this Article shall not deprive the Government of other rights the Government may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed-on fireproofing that has failed within the specified warranty period. Failures include but are not limited to the following:

1. Cracking, flaking, eroding in excess of specified requirements, peeling, and delaminating of sprayed-on fireproofing from substrates due to defective materials and workmanship within the specified warranty period.
2. Not covered under the warranty are failures attributable to damage by occupants and Government's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and to other causes not reasonably foreseeable under conditions of normal use.

C. Warranty Period: 2 years from date of Final Acceptance by the Government.

## PART 2 - PRODUCTS

### 2.1 SPRAYED-ON CEMENTITIOUS FIREPROOFING MATERIALS

- A. General: For sprayed-on fireproofing provide manufacturer's standard products complying with requirements indicated in this article for material composition and physical properties representative of installed products.
- B. Material Composition: Cementitious fireproofing consisting of factory-mixed, dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
- C. Physical Properties: Minimum values, unless otherwise indicated or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed below:
  1. Bond Strength: 150 lbf per sq. ft. as determined per ASTM E 736 under the following conditions:
    - a. Field test sprayed-on fireproofing that is applied to flanges of wide-flange structural steel members on surfaces matching those that will exist for remainder of steel receiving fireproofing.
    - b. If surfaces of structural steel receiving sprayed-on fireproofing are primed or otherwise painted, perform series of bond tests specified in UL "Fire Resistance Directory" for coating materials.
    - c. Minimum sprayed-on fireproofing thickness tested in laboratory shall be 0.75 inch.
  2. Compressive Strength: 5.21 lbf per sq. in. as determined in the laboratory per ASTM E 761. Minimum sprayed-on fireproofing thickness tested shall be 0.75 inch and the minimum dry density shall be as specified, but not less than 15 pcf.
  3. Corrosion Resistance: No evidence of corrosion as determined per ASTM E 937.
  4. Deflection: No cracking, spalling, delamination or the like as determined per ASTM E 759.
  5. Effect of Impact on Bonding: No cracking, spalling, delamination or the like as determined per ASTM E 760.
  6. Air Erosion: Maximum weight loss of 0.025 gram per sq. ft. in 24 hours as determined per ASTM E 859. For laboratory tests, the minimum sprayed-on fireproofing thickness

- is 0.75 inch, the maximum dry density is 15 pcf, test specimens are not pre-purged by mechanically induced air velocities, and tests are terminated after 24 hours.
7. Dry Density: 15 pcf for average and individual densities regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, as determined per ASTM E 605 or Appendix A "Alternate Method for Density Determination" of AWCI Technical Manual 12-A.
  8. Thickness: Provide minimum average thickness required for fire-resistive design indicated according to the following criteria, but not less than 0.375 inch, as determined per ASTM E 605.
    - a. Where the referenced fire-resistive design lists a thickness of 1 inch or greater, the minimum allowable individual sprayed-on fireproofing thickness is the design thickness minus 0.25 inch.
    - b. Where the referenced fire-resistive design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual sprayed-on fireproofing thickness is the greater of 0.375 inch or 75 percent of the design thickness.
    - c. No reduction in average thickness is permitted for those fire-resistive designs whose fire resistance ratings were established at densities of less than 15 pcf.
  9. Surface-Burning Characteristics: Maximum flame-spread value of 10 and smoke-developed value of 0.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
1. Cementitious Fireproofing:
    - a. Pyrolite 1, Carbolite Fireproofing Products Div., Carbolite Co.

## 2.2 AUXILIARY FIREPROOFING MATERIALS

- A. General: Provide auxiliary fireproofing materials that are compatible with sprayed-on fireproofing products and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in the fire-resistive designs indicated.
- B. Substrate Primers:
  1. Prime existing steel substrates with a UL listed bond primer certified by the manufacturer to adhere to existing lead base primer. Known acceptable source: Rust Bond Penetrating Sealer by Carbolite.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates with Installer present to determine if they are in satisfactory condition to receive sprayed-on fireproofing. A substrate is in satisfactory condition if it complies with the following:
  - 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
  - 2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
  - 3. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying the fireproofing.
- B. Conduct tests according to sprayed-on fireproofing manufacturer's recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond where there is any doubt as to their presence.
- C. Do not proceed with installation of fireproofing until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of substances that could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.
- B. Prime substrates where recommended by fireproofing manufacturer, except where compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- C. For exposed sprayed-on fireproofing applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished fireproofing surface. Remove minor projections and fill voids that would telegraph through fireproofing after application.
- D. Cover other work subject to damage from fall-out or overspray of fireproofing materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.

### 3.3 INSTALLATION, GENERAL

- A. Comply with fireproofing manufacturer's instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fireproofing materials; as applicable to the particular conditions of installation and as required to achieve fire-resistance ratings indicated.

- B. Apply sprayed-on fireproofing that is identical to products tested as specified in Part 1 under "Test Reports" in "Submittals" article, with respect to rate of application, use of sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Extend fireproofing in full thickness over entire area of each substrate to be protected. Unless otherwise recommended by fireproofing manufacturer, install body of fireproof covering in a single course.
- D. Apply fireproofing materials by sprayed-on method to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended by manufacturer.
- E. For applications over encapsulant materials, including lock-down (post-removal) encapsulants, apply sprayed-on fireproofing that differs in color from that of the encapsulant over which it is applied.
- F. Where sealers are used, apply products that are tinted to differentiate it from the sprayed-on fireproofing over which it is applied.

#### 3.4 INSTALLING CONCEALED FIREPROOFING

- A. Apply concealed fireproofing in thickness' and densities indicated but not less than those required to achieve fire-resistance ratings designated for each condition and comply with requirements for thickness specified.

#### 3.5 INSTALLING EXPOSED FIREPROOFING

- A. Apply exposed fireproofing in thickness' and densities indicated but not less than that required to achieve fire-resistance ratings designated for each condition, unless greater thickness' and densities are indicated.
  - 1. For steel beams and bracing, provide a thickness of not less than 1 inch.
  - 2. For metal floor or roof decks, provide a thickness of not less than 1/2 inch.
- B. Provide a uniform finish complying with description indicated for each type of material and matching COR's sample or, if none, finish approved for field-erected mockup.
- C. Apply cement-aggregate cementitious fireproofing to produce the following finish:
  - 1. Spray textured finish with no further treatment.

#### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: A qualified independent testing agency employed and paid by the Contractor will perform field quality-control testing.
- B. Extent and Testing Methodology: Testing of completed fireproofing will take place in successive stages in areas of extent described below; do not proceed with fireproofing of next area until test results for previously completed fireproofing show compliance with requirements.



1. Extent of Each Test Area: Each bay, 10,000 sq. ft. of floor area, or total floor area, whichever produces greatest number of test areas.
  2. Within each area, testing agency will randomly select one structural member of each type (primary beam, secondary beam, joist, truss, steel deck, and column) and test fireproofing as follows:
    - a. For cohesion and adhesion per ASTM E 736.
    - b. For thickness per ASTM E 605.
    - c. Lower flanges and webs of beams, column webs, column flanges, and floor deck for density per ASTM E 605 or Appendix A "Alternate Method for Density Determination" of AWCI Technical Manual 12-A.
    - d. When testing discovers fireproofing not in compliance with requirements, testing agency will perform additional random testing to determine extent of noncompliance.
- C. Testing agency will report test results promptly and in writing to Contractor and COR.
- D. Remove and replace fireproofing where test results indicate that it does not comply with specified requirements for cohesion and adhesion or for density or both.
- E. Apply additional fireproofing per manufacturer's directions where test results indicate that the thickness does not comply with specified requirements.
- F. Additional Testing: Where fireproofing is removed and replaced or repaired, additional testing will be performed to determine compliance with specified requirements.

### 3.7 CLEANING, REPAIR, AND PROTECTION

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material over-spray and fall-out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Cure exposed cementitious fireproofing materials according to fireproofing manufacturer's recommendations to prevent premature drying.
- C. Protect fireproofing, according to advice of fireproofing manufacturer and Installer, from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion.
- D. Coordinate installation of fireproofing with other construction to minimize the need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and patch any areas where fireproofing was removed or damaged.
- E. Repair or replace work that has not been successfully protected.

END OF SECTION 07251

SECTION 07270 - FIRE-STOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fire-stopping for the following:
  - 1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 3. Sealant joints in fire-resistance-rated construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 07210 "Building Insulation" for safing insulation and accessories.
  - 2. Section 07920 "Joint Sealants" for non-fire-resistive-rated joint sealants.
  - 3. Sections specifying ducts and piping penetrations.
  - 4. Sections specifying cable and conduit penetrations.

1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. C 719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement.
  - 2. C 920 Specification for Elastomeric Joint Sealants.
  - 3. C 1193 Guide for Use of Joint Sealants.
  - 4. E 84 Test Method for Surface Burning Characteristics of Building Materials.
  - 5. E 119 Test Methods for Fire Tests of Building Construction and Materials.
  - 6. E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
  - 7. E 814 Test Method for Fire Tests of Through-Penetration Fire Stops.
- B. Environmental Protection Agency (EPA)
  - 1. CFR40 (PART 763) Asbestos Hazardous Emergency Response Act, Friable Asbestos-containing Materials in Schools.
- C. Underwriters Laboratories Inc. (UL)
  - 1. Fire Resistance Directory

### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide fire-stopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Fire-stop Systems: Provide through-penetration fire-stop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Fire-stop Systems: Provide through-penetration fire-stop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
  - 1. Where fire-stop systems protect penetrations located outside of wall cavities.
  - 2. Where fire-stop systems protect penetrations located outside fire-resistive shaft enclosures.
  - 3. Where fire-stop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
  - 4. Where fire-stop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For fire-stopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
  - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration fire-stop systems.
  - 2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide fire-stop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
  - 3. For penetrations involving insulated piping, provide through-penetration fire-stop systems not requiring removal of insulation.
- F. For fire-stopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

### 1.4 SUBMITTALS

- A. Product data for each type of product specified.
  - 1. Certification by fire-stopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are non-toxic to building occupants.
- B. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration fire-stop system, and each kind of construction

condition penetrated and kind of penetrating item. Include fire-stop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration fire-stop configuration for construction and penetrating items.
  2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration fire-stop condition, submit illustration approved by fire-stopping manufacturer's fire protection engineer with modifications marked.
- C. Product certificates signed by manufacturers of fire-stopping products certifying that their products comply with specified requirements.
- D. Product test reports form, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of fire-stopping with requirements based on comprehensive testing of current products.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of architects and owners, and other information specified.

#### 1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide fire-stopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
1. Fire-stopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for fire-stop systems that is acceptable to authorities having jurisdiction.
  2. Through-penetration fire-stop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least **0.01 inch of water** is maintained at a distance of **0.78 inch** below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
    - a. Through-penetration fire-stop system products bear classification marking of qualified testing and inspecting agency.
    - b. Through-penetration fire-stop systems correspond to those indicated by reference to through-penetration fire-stop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
  3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least **0.01 inch of water**, as measured **0.78 inch** from the face exposed to furnace fire. Provide systems complying with the following requirements:

- a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
  - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Information on drawings referring to specific design designations of through-penetration fire-stop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the COR's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.
- C. Installer Qualifications: Engage an experienced Installer who has completed fire-stopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.
- D. Single-Source Responsibility: Obtain through-penetration fire-stop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- E. Provide fire-stopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration fire-stop systems are installed per specified requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-stopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.
- B. Store and handle fire-stopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install fire-stopping when ambient or substrate temperatures are outside limits permitted by fire-stopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate fire-stopping per fire-stopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

#### 1.8 SEQUENCING AND SCHEDULING

- A. Notify Owner's inspection agency at least 1 week in advance of fire-stopping installations; confirm dates and times on days preceding each series of installations.
- B. Do not cover up those fire-stopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

## PART 2 - PRODUCTS

### 2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide fire-stopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the fire-stopping under conditions of service and application, as demonstrated by fire-stopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each fire-stopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the fire-stopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
  - 1. Permanent forming/damming/backing materials including the following:
    - a. Semi-refractory fiber (mineral wool) insulation.
    - b. Ceramic fiber.
    - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    - d. Fire-rated form-board.
    - e. Joint fillers for joint sealants.
  - 2. Temporary forming materials.
  - 3. Substrate primers.
  - 4. Collars.
  - 5. Steel sleeves.

- C. Applications: Provide fire-stopping systems composed of materials specified in this Section that comply with system performance and other requirements.

### 2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.
- B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.
- C. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- D. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

- E. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
- H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogenous mortar.
- I. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated fire-stop system limits use to nonsag grade for both opening conditions.
  - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
  - 3. Grade for Vertical Surfaces: Nonsag grade for openings in vertical and other surfaces.
- L. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated fire-stop system limits use to nonsag grade for both opening conditions.
  - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
  - 3. Grade for Vertical Surfaces: Nonsag grade for openings in vertical and other surfaces.
- M. Known Acceptable Sources: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Ceramic-Fiber and Mastic Coating:
    - a. Fire-Master Bulk and Fire-Master Mastic, Thermal Ceramics.



2. Ceramic-Fiber Sealant:
  - a. Metacaulk 525, The RectorSeal Corporation.
3. Endothermic, Latex Sealant:
  - a. Fyre-Shield, Tremco Inc.
4. Endothermic, Latex Compounds:
  - a. Flame-Safe FS900/FST900 Series, International Protective Coatings Corp.
5. Intumescent Latex Sealant:
  - a. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.
6. Intumescent Putty:
  - a. Fire Barrier Moldable Putty, 3M Fire Protection Products.
7. Intumescent Wrap Strips:
  - a. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
8. Job-Mixed Vinyl Compound:
  - a. USG Fire-code Compound, United States Gypsum Co.
9. Mortar:
  - a. K-2 Fire-stop Mortar, Bio Fireshield, Inc.
10. Pillows/Bags:
  - a. Fire-stop Pillows, Bio Fireshield, Inc.
11. Silicone Foams:
  - a. Pensil 200 Foam, General Electric Co.
12. Silicone Sealants:
  - a. CS240 Fire-stop Sealant, Hilti Construction Chemicals, Inc.
13. Solvent-Release-Curing Intumescent Sealants:
  - a. Fire Barrier CP 25N/S Caulk, 3M Fire Protection Products.
  - b. Fire Barrier CP 25S/L Caulk, 3M Fire Protection Products.

## 2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
- B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
  - 1. Provide selections made by COR from manufacturer's full range of standard colors for products of type indicated.
- C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
  - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
    - a. 50 percent movement in both extension and compression for a total of 100 percent movement.
    - b. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
- D. Multi-component, Nonsag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
  - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
    - a. 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement.
    - b. 50 percent movement in both extension and compression for a total of 100 percent movement.
- E. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.
- F. Known Acceptable Sources: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Single-Component, Neutral-Curing, Silicone Sealant:
    - a. 864, Pecora Corp.
  - 2. Multi-component, Nonsag, Urethane Sealant:

- a. Vulkem 922, Mameco International Inc.
- 3. Single-Component, Nonsag, Urethane Sealant:
  - a. Vulkem 921, Mameco International Inc.

## 2.4 MIXING

- A. For those products requiring mixing prior to application, comply with fire-stopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce fire-stopping products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of fire-stopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing fire-stopping to comply with recommendations of fire-stopping manufacturer and the following requirements:
  - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of fire-stopping.
  - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with fire-stopping. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by fire-stopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fire-stopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-stopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

### 3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration fire-stop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration fire-stop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of fire-stop systems.
- C. Install fill materials for through-penetration fire-stop systems by proven techniques to produce the following results:
  - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

#### 3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

#### 3.5 FIELD QUALITY CONTROL

- A. Inspecting agency employed and paid by the Contractor will examine completed fire-stopping to determine, in general, if it is being installed in compliance with requirements.
- B. Inspecting agency will report observations promptly and in writing to Contractor and COR.

- C. Do not proceed to enclose fire-stopping with other construction until reports of examinations are issued.
- D. Where deficiencies are found, repair or replace fire-stopping so that it complies with requirements.

3.6 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of fire-stopping products and of products in which opening and joints occur.
- B. Protect fire-stopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated fire-stopping immediately and install new materials to produce fire-stopping complying with specified requirements.

END OF SECTION 07270

## SECTION 07600-FLASHING AND SHEET METAL

### PART 1 - GENERAL

#### 1.1 SCOPE

All flashing will be installed as part of the roofing manufacturer's approved roof system. Sheet metal work shall be accomplished to form weathertight construction. Work shall be installed without waves, warps, buckles, fastening stresses or distortion and shall allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Exposed edges shall be hemmed. Bottom edges of exposed vertical surfaces shall be angled to form drips. Flashing at the end of a run shall be formed into a three dimensional configuration to direct water to the outside of the system. Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations. Factory-fabricated components shall be packed in cartons marked with the manufacturer's name or trademark. Bulk materials from which items are field fabricated shall have manufacturer's name or trademark printed or embossed at frequent intervals to permit easy identification. In general, products that are part of the manufacturer's approved roof membrane system are to be supplied and installed in accordance with manufacturer's installation instructions.

Requirements included - Contractor shall be responsible for all cutting, fitting and patching, required to complete the work or to:

- A. Remove and replace defective work.
- B. Remove and replace work not conforming to requirements.

#### 1.2 APPLICABLE PUBLICATIONS

The following specifications and standards of the issues currently in force, form a part of this section and are applicable as specified herein.

- A. Air Movement and Control Association (AMCA)
  - 1. AMCA 500 Test Methods for Louvers, Dampers and Shutters – Latest Edition
- B. American Society for Testing And Materials (ASTM)
  - 1. ASTM A 167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip – Latest Edition
  - 2. ASTM B 209 Aluminum and Aluminum-Alloy Sheet and Plate – Latest Edition
  - 3. ASTM B 221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes – Latest Edition
  - 4. ASTM B 370 Copper Sheet and Strip for Building Construction – Latest Edition
  - 5. ASTM B 486 Paste Solder – Latest Edition
  - 6. ASTM B 506 Copper-Clad Stainless Steel Sheet and Strip for Building
  - 7. Construction – Latest Edition

8. ASTM D 543 Resistance of Plastics to Chemical Reagents– Latest Edition
9. ASTM D 751 Coated Fabrics – Latest Edition
10. ASTM D 822 Conducting Tests on Paint and Related Coatings and Materials
11. Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus – Latest Edition
12. ASTM D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated
13. Poly (Vinyl Chloride) (CPVC) Compounds – Latest Edition
14. ASTM E 96 Water Vapor Transmission of Materials – Latest Edition

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

1. SMACNA-02 Architectural Sheet Metal Manual – Latest Edition

1.3 SUBMITTALS

Submittals required include, but are not necessarily limited to, the following:

- A. Sheet Metal Drawings - Drawings showing weights, gauges, or thickness of sheet metal; type of material; joining, expansion-joint spacing, and fabrication details; and installation procedures. Materials shall not be delivered to the site until after the approved detail drawings have been returned to the Contractor.

PART 2 – MATERIAL

Materials shall conform to the requirements of the roof manufacturer's approved membrane flashing system.

2.1 ALUMINUM EXTRUSIONS

ASTM B 221, Alloy 6063, Temper T5.

2.2 FASTENERS

Fasteners shall be the best type for the application.

2.3 PLASTIC HARDSETTING SEALANT

As recommended by aluminum manufacturer.

2.4 POLYVINYL CHLORIDE (PVC) REGLETS

ASTM D 1784

2.5 SHEET METAL

As recommended by roof manufacturer.

2.6 SOLDER:

ASTM B 486, Alloy 50B, for use with copper and Alloy 60B for use with stainless steel



## PART 3 – EXECUTION

### 3.1 PROTECTION OF ALUMINUM

Aluminum shall not be used where it will be in contact with copper or where it will contact water which flows over copper surfaces. Aluminum that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

- A. Paint - Aluminum surfaces to be protected shall be solvent cleaned and given a coat of zinc-molybdate primer and one coat of aluminum paint.
- B. Nonabsorptive Tape or Gasket - Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and shall be cemented to the aluminum surface using a cement compatible with aluminum.

### 3.2 SOLDERING, RIVETING, SEAMING, AND SEALING

- A. Soldering - Soldering shall apply to copper, copper clad stainless steel, and stainless steel items. Edges of sheet metals, except lead coated material shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of lead coated material to be soldered shall be scraped or wire-brushed to produce a bright surface and seams shall have a liberal amount of flux brushed in before soldering is begun. Edges of stainless steel to be pretinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a solution of washing soda in water and rinsed with clean water.
- B. Riveting and Sealing - Joints in aluminum sheets 0.040 inch or less in thickness shall be made mechanically and sealed with the sealant specified.
- C. Seams - Flat-lock and soldered-lap seams shall finish not less than 1-inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

### 3.3 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints shall be spaced approximately 1/8-inch apart. The cleat shall be fastened to the supporting construction with nails evenly spaced not over 12 inches on centers, unless otherwise noted. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry. The cleat for fascia anchorage shall be installed to extend below the supporting construction to form a drip and to allow the flashing to be hooked over the lower edge at least 3/4 inch. The cleat shall be of sufficient width to provide adequate bearing area to insure a rigid installation. Where horizontal nailer is vented for insulation and the cleat is placed over masonry or concrete, the cleat shall be installed over 1/16-inch thick metal washers placed at screws. Washers shall be of metal that is electrolytically compatible with the continuous cleat.

### 3.4 EXPANSION JOINTS

Expansion joints shall be provided at 40-foot intervals for copper and stainless steel and at 32-foot intervals for aluminum, except that where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing an additional joint shall be provided. Joints shall be evenly spaced.

### 3.5 FLASHINGS

Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls is covered in appropriate sections for such work.

- A. Base Flashing - Metal base flashing shall be installed at locations needed per proper roofing installation practice and shall be coordinated with roofing work.

### 3.6 REGLETS

- A. Reglets shall be a factory fabricated product of proven design, complete with fittings and special shapes as may be required. Open-type reglets shall be filled with fiberboard or other suitable separator to prevent crushing of the slot during installation. Reglets shall be located not less than 8 inches nor more than 16 inches above roofing not having cant strips or shall be located not less than 5 inches nor more than 13 inches above cant strip. Reglet plugs shall be spaced not over 12 inches on centers and reglet grooves shall be filled with sealant. Friction or slot-type reglets shall have metal flashings inserted the full depth of slot and shall be lightly punched every 12 inches to crimp the reglet and cap flashing together.

## PART 4 – QUALITY ASSURANCE

### 4.1 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, weathertight, ventilated areas until immediately before installation.

### 4.2 CONTRACTOR QUALITY CONTROL

- A. The Contractor shall establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner.

END OF SECTION 07600

SECTION 07720-ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Prefabricated curbs, cants, and equipment support units.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 07600 "Flashing and Sheet Metal" for metal flashing, scuppers, gutters, and down-spouts.

1.2 REFERENCE STANDARDS

A. American Architectural Manufacturers Association (AAMA)

B. American Society for Testing and Materials (ASTM)

1. A 446 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
2. A 525 Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
3. A 526 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
4. C 920 Specifications for Elastomeric Joint Sealants.
5. D 256 Test Method for Impact Resistance of Plastics and Electrical Insulating Materials.
6. D 4586 Specification for Asphalt Roof Cement, Asbestos Free.
7. D 4802 Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet.

C. American Wood-Preservers' Association (AWPA)

1. C 2 Lumber, Timber, Bridge Ties, and Mine Ties - Preservative Treatment by Pressure Process.

D. National Association of Architectural Metal Manufacturers (NAAMM)

1. Metal Finishes Manual.

E. National Roofing Contractor Association (NRCA)

F. Sheet Metal and Air Conditioning Contractors National Association, Inc.(SMACNA)

1. Architectural Sheet Metal Manual. 4th ed.

G. Steel Structures Painting Council (SSPC)

1. Paint 12 - Paint Specification No. 12: Cold-Applied Asphalt Mastic (Extra Thick Film).

1.3 SUBMITTALS

- A. Product data for each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop drawings showing fabrication and installation of each roof accessory specified including fully dimensioned plans, elevations, sections, details of components, and attachments to other units of work. Also show layout, anchorage details, rough-in requirements, conditions on the roof or for other accessories, and repairs and tie-ins to existing roof assemblies.
- C. Samples for initial selection purposes in the form of manufacturer's color charts showing full range of colors, textures, shapes, and sizes available for each type of roof accessory indicated.
- D. Samples for verification purposes in full-size units or representative section of each type of roof accessory indicated for each color, texture, shape, and sizes specified.
- E. Coordination Drawings: Submit coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping, or conduit. Indicate dimensions and locations of items provided under this Section, together with relationships and methods of attachment to adjacent construction and to mechanical or electrical items.

1.4 QUALITY ASSURANCE

- A. Standards - Comply with the following:
  1. SMACNA "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap-flashing to coordinate with type of roofing indicated.
  2. NRCA "Roofing and Waterproofing Manual" details for installation of units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Known Acceptable Source - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  1. Prefabricated Curbs, Cants, and Equipment Support Units: Custom Curb, Inc.

2.2 MATERIALS, GENERAL

- A. Commercial-Quality Galvanized Steel Sheet: ASTM A 526 with G90 coating complying with ASTM A 525.
- B. Insulation - Manufacturer's standard rigid or semi-rigid glass-fiber board of thickness indicated.
- C. Wood Nailers - Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWWA C2; not less than 1-1/2 inch thick.
- D. Fasteners - Same metal as metals being fastened, or non-magnetic stainless steel or other non-corrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
  - 1. Where removal of exterior exposed fasteners affords access to building, provide non-removable fastener heads.
- E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.
- F. Bituminous Coating - SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coating.
- G. Mastic Sealant - Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- H. Elastomeric Sealant - Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, and, A.
- I. Roofing Cement - ASTM D 4586, non-asbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

## 2.3 FINISHES

- A. General - Comply with NAAMM "Metal Finishes Manual" for recommendations on applying and designating finishes.
- B. Fluoropolymer Two-Coat Coating System - Manufacturer's standard two-coat thermocured system, complying with AAMA 605.2, composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene resin by weight; complying with AAMA 605.2.

## 2.4 PREFABRICATED CURBS, CANTS, AND EQUIPMENT SUPPORTS

- A. General - Comply with loading and strength requirements as indicated where units support other work. Coordinate dimensions with rough-in information or shop drawings of equipment to be supported.

1. Fabricate of structural-quality, hot-dip galvanized or galvalume sheet steel, factory-primed and prepared for painting with welded or sealed mechanical corner joints.
2. Provide Curbs and supports complete with integral cant strips and base profile coordinated with roof insulation thickness and roof slope. Provide preservative-treated wood nailers at tops of curbs, coordinate with thickness of insulation and roof flashing as indicated, tapered as necessary to compensate for roof to establish positive deck to establish positive slopes of 1/4 inch per foot and less.
3. Unless otherwise indicated or required for strength, fabricate units of minimum 0.0747-inch thick metal, and to minimum height of 12 inches.
4. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot, fabricate curb/support units with height tapered to match slope to level tops of units.
5. Custom fabricate cants with nailing flanges at wall and at deck surfaces, base coordinated with tapes and thickness of insulation, and integral cant.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General - Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, vapor barriers, roof insulation, roofing and flashing, as required, to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses, as well as inward and outward loading pressures.
  1. Except as otherwise indicated, install roof accessory items according to construction details of NRCA "Roofing and Waterproofing Manual."
- B. Isolation - Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- C. Flange Seals - Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- D. Cap Flashing - Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter-flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

#### 3.2 CLEANING AND PROTECTION

- A. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION 07720



SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below:
  - a. Joints between metal panels.
  - b. Joints between different materials listed above.
  - c. Perimeter joints between materials listed above and frames of doors and windows.
  - e. Other joints as indicated.
2. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
  - a. Control and expansion joints on exposed interior surfaces of exterior walls.
  - b. Perimeter joints of exterior openings where indicated.
  - c. Joints between tops of non-load-bearing unit masonry walls and underside of cast-in-place concrete slabs and beams.
  - d. Tile control and expansion joints.
  - e. Vertical control joints on exposed surfaces of interior unit masonry and partitions.
  - f. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
  - g. Perimeter joints of toilet fixtures.
  - h. Mildew resistant sealant.
  - i. Other joints as indicated.
3. Interior joints in horizontal traffic surfaces as indicated below:
  - a. Control and expansion joints in tile flooring.
  - b. Other joints as indicated.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 07270 "Fire-Stopping" for through-penetration fire-stopping systems.
2. Section 07620 "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.
3. Section 08510, "Exterior Security Aluminum Windows" for sealants used in glazing.

4. Section 09255 "Gypsum Board Assemblies" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.
5. Section 09300 "Tile" for sealing tile joints.
6. Section 09511 "Acoustical Panel Ceilings" for sealing edge moldings at perimeter of acoustical ceilings.

## 1.2 REFERENCE STANDARDS

### A. American Architectural Manufacturers Association (AAMA)

1. 803.3 Voluntary Specification for Exterior Sealing Compound.

### B. American Society for Testing and Materials (ASTM)

1. C 719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement.
2. C 792 Standard Test Method for Effects of Heat Aging on Weight Loss, Cracking and Chalking of Elastomeric Sealants.
3. C 834 Standard Specification for Latex Sealants.
4. C 919 Standard Practice for Use of Sealants in Acoustical Applications.
5. C 920 Standard Specification for Elastomeric Joint Sealants.
6. C 1083 Standard Test Method for Water Absorption of Cellular Elastomeric Gaskets and Sealing Materials.
7. C 1085 Standard Specification for Butyl Rubber-Based Solvent -Release Sealants.
8. C 1193 Standard Guide for Use of Joint Sealant.
9. D 1623 Standard Test Method for Tensile and Tensile Adhesion properties of Rigid Cellular Plastics.
10. E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
11. E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
12. E 699 Standard Criteria for Evaluation of Agencies Involved in Testing. Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E-6.

## 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

## 1.4 SUBMITTALS

- A. Product data from manufacturers for each joint sealant product required.
  - 1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.
- B. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- E. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of architects and owners, plus other information specified.
- F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- G. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.
- H. Pre-construction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to COR's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the Work.

- C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.
- D. Pre-construction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers samples of materials that will contact or affect joint sealants for compatibility and adhesion testing as indicated below:
  - 1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
    - a. Perform tests under normal environmental conditions that will exist during actual installation.
  - 2. Submit not less than 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.
  - 4. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
  - 5. Testing will not be required when joint sealant manufacturer is able to submit joint preparation data required above that are acceptable to COR and are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- E. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to COR.
  - 1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
  - 2. Include test results performed on joint sealants after they have cured for 1 year.
- F. Pre-construction Field Testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:
  - 1. Locate test joints where indicated or, if not indicated, as directed by COR.
  - 2. Conduct field tests for each application indicated below:
    - a. Each type of elastomeric sealant and joint substrate indicated.
    - b. Each type of non-elastomeric sealant and joint substrate indicated.

3. Notify COR one week in advance of the dates and times when mock-ups will be erected.
  4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
  5. Test Method: Test joint sealants by hand pull method described below:
    - a. Install joint sealants in 5-foot joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.
    - b. Make knife cuts horizontally from one side of joint to the other followed by 2 vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 2-inch cuts. Place a mark 1 inch from top of 2-inch piece.
    - c. Use fingers to grasp 2-inch piece of sealant just above 1-inch mark; pull firmly down at a 90-degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
  6. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
  7. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- G. Apply elastomeric sealants to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and proper sequence of execution.
- H. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of the Division 1 Section covering this activity.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).
  2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

## 1.8 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
1. Provide selections made by COR from manufacturer's full range of standard colors for typical applications.

### 2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

- B. Available Products: Subject to compliance with requirements, elastomeric sealants that may be incorporated in the Work include, but are not limited to, the products specified in each Elastomeric Sealant Data Sheet.

2.3 SOLVENT-RELEASE-CURING JOINT SEALANTS

- A. Butyl Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be non-staining, paintable, and have a tack-free time of 24 hours or less.
- B. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.
- C. Available Products: Subject to compliance with requirements, solvent-release-curing joint sealants that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Butyl Sealant:
    - a. "BC-158," Pecora Corp.
    - b. "PTI 757," Protective Treatments, Inc.
    - c. "Sonneborn Multi-Purpose Sealant," Sonneborn Building Products Div., ChemRex, Inc.

2.4 LATEX JOINT SEALANTS

- A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.
- B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- C. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.
- D. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Acrylic-Emulsion Sealant:
    - a. "AC-20," Pecora Corp.
    - b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.



- c. "Tremco Acrylic Latex 834," Tremco, Inc.

## 2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834 and the following requirements:
  - 1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
  - 2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

## 2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  - 1. Open-cell polyurethane foam.
  - 2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in unruptured state.
  - 3. Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
  - 4. Any material indicated above.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on pre-construction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
  - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    - a. Do not leave gaps between ends of joint fillers.
    - b. Do not stretch, twist, puncture, or tear joint fillers.
    - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
  - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
  - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

### 3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

## ELASTOMERIC JOINT SEALANT DATA SHEET 1

Elastomeric Joint Sealant Conditions: Typical conditions shown or specified at glazing systems where joint sealant is required or appropriate, except as otherwise identified below.

Base Polymer: Neutral-curing silicone.

Modulus: Medium

Type: S (single component).

Grade: NS (nonsag).

Class: 25.

Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.

Use[s] Related to Exposure: NT (non-traffic).

Uses Related to Joint Substrates: M,G,A, typically, and, as applicable to joint substrates indicated, O.

Use O Joint Substrates: Glass, color anodized aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, CMU, metal siding.

Known Acceptable Sources: Including but not limited to the following:

795 by Dow Corning;  
Silglaze N by GE;  
864 BY Pecora

#### ELASTOMERIC JOINT SEALANT DATA SHEET 2

Elastomeric Joint Sealant Conditions: Floor to floor traffic joints.

Base Polymer: Urethane, self-leveling.

Type: M (multi-component). or S (single component).

Grade: P (pourable).

Class: 25.

Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.

Use[s] Related to Exposure: T (traffic).

Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

Use O Joint Substrates: Terrazzo tile.

Known Acceptable Sources:

Vulkem 45 or 245 by Mameco;  
NR-200 or NR-201 Urexpam by Pecora;  
Sonolastic SL-1 or SL2 by Sonneborn

#### ELASTOMERIC JOINT SEALANT DATA SHEET 3

Elastomeric Joint Sealant Conditions: Sloped and vertical non-traffic bearing conditions.

Base Polymer: Urethane, toolable.

Type: M (multi-component)

Grade: NS (nonsag).

Class: 25.

Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.

Use[s] Related to Exposure: NT (non-traffic).

Uses Related to Joint Substrates: M, nd, as applicable to joint substrates indicated, O.

Known Acceptable Sources:

Vulkem 922 by Mameco;  
Dynatrol II by Pecora;  
Dymeric 511 by Tremco

ELASTOMERIC JOINT SEALANT DATA SHEET 4

Elastomeric Joint Sealant Conditions: Tiled surfaces, toilet rooms, wet areas, and at toilet and plumbing fixture penetrations through walls and floors.

Base Polymer: One-Part Mildew-Resistant Silicone Sealant

Type: S (single component)

Grade: NS (nonsag).

Class: 25.

Use[s] Related to Exposure: NT (non-traffic).

Uses Related to Joint Substrates: G, A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

Known Acceptable Sources:

"Dow Corning 786"; Dow Corning Corp.  
"SCS 1702"; General Electric Co.  
"863 #345 White"; Pecora Corp.

END OF SECTION 07920

# **DIVISION 8**

## **DOORS & FRAMES**

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes steel doors, and steel frames, with side lites.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 08710 "Door Hardware" for door hardware and weather-stripping.
  - 2. Section 09255 "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
  - 3. Section 09900 "Painting" for field painting primed doors and frames.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
  - 1. A 115 Series: A Collection of A115.1- A115.17, Specifications for Steel Door and Frame Preparation for Hardware.
- B. American Society for Testing and Materials (ASTM)
  - 1. A 153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 2. A 366 Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
  - 3. A 525 Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process
  - 4. A 526 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
  - 5. A 569 Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
  - 6. A 620 Specification for Steel, Sheet, Carbon, Drawing Quality, Special Killed, Cold-Rolled.
  - 7. A 642 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Drawing Quality, Special Killed.
  - 8. A 780 Practice for Repair of Damaged Hot-Dip Galvanized Coatings.
  - 9. C 236 Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
  - 10. C 578 Specification for Rigid, Cellular Polystyrene Thermal Insulation.
  - 11. C 591 Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation.



12. C 976 Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box.
13. E 152 Methods for Fire Tests of Door Assemblies.
14. E 413 Classification for Rating Sound Insulation.
15. E 1408 Method for Laboratory Measurement of the Sound Transmission Loss of Door, Panels and Door Systems.

C. Department of Defense (DOD)

1. DOD-P-21035 Paint, High Zinc Dust Content, Galvanizing Repair.

D. National Association of Architectural and Metal Manufacturers (NAAMM)

E. National Fire Protection Association (NFPA)

1. 80 Fire Doors and Windows

F. Steel Door Institute (SDI)

1. 100 Recommended Specifications for Standard Steel Doors and Frames.
2. 105 Recommended Erection Instructions for Steel Frames.
3. 107 Hardware on Steel Doors (Reinforcement-Application).
4. 108 Recommended Selection and Usage Guide for Standard Steel Doors.
5. 111 Series: 111A-111F Recommended Details, Steel Doors and Frames.
6. 112 Galvanized Standard Steel Doors and Frames.
7. 117 Manufacturing Tolerances Standard Steel Doors and Frames.

G. Steel Structures Painting Council (SSPC)

1. PA 1 Paint Application Specification No. 1.
2. Paint 20 Paint Specification No. 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.3 SUBMITTALS

- A. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes. Provide Manufacturer's Standard Data Sheets (MSDS) sheets for coatings, for core materials, and for finishing materials.
- B. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

- C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
  - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- D. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for factory-finished doors and frames.
- E. Samples for verification of each type of exposed finish required, prepared on Samples not less than 3 by 5 inches and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- F. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.

#### 1.4 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors conform to all standard construction requirements of tested and labeled fire-rated door assemblies except for size.
  - 2. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to COR; otherwise, remove and replace damaged items as directed.

- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569.
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366, commercial quality, or ASTM A 620, drawing quality, special killed.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526, commercial quality, or ASTM A 642, drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 coating designation, mill phosphatized.
- D. Supports and Anchors: Fabricated from not less than 0.0478-inch- thick steel sheet; 0.0516-inch- thick galvanized steel where used with galvanized steel frames.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

### 2.2 DOORS

- A. Steel Doors: Provide 1-3/4-inch-thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:
  - 1. Interior Doors: Grade III, extra heavy-duty, Model 2A, seamless design, minimum 0.0747-inch-thick cold-rolled steel sheet faces.
  - 2. Exterior Doors: Grade III, extra heavy-duty, Model 2A, seamless design, minimum 0.0785-inch-thick galvanized steel sheet faces.

### 2.3 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.0478-inch-thick cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners, continuously welded construction for exterior applications and knocked down for field assembly at interior applications.
  2. Form exterior frames from 0.0785-inch-thick galvanized steel sheet.
- B. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- C. Plaster Guards: Provide minimum 0.0179-inch- thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

## 2.4 GLAZING

- A. Laminated Ceramic Glazing Material: Product in the form of two lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch (8-mm) nominal thickness; polished on both surfaces, transparent.
1. Fire-Protection Rating: As indicated for the assembly in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to the authorities have jurisdiction.
  2. Polished on both surfaces, transparent.
  3. Known acceptable source: HeLite Plus, manufactured by Nippon Electric Glass Co. and distributed by Technical Glass Projects; or approved equal.
- B. Miscellaneous Glazing Materials
1. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

## 2.5 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
    - a. Resin-impregnated paper honeycomb.
    - b. Rigid polyurethane conforming to ASTM C 591.
    - c. Rigid polystyrene conforming to ASTM C 578.
    - d. Unitized steel grid.
    - e. Vertical steel stiffeners.
    - f. Rigid mineral fiber with internal sound deadener on inside of face sheets.

2. Clearances: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between non-fire-rated pairs of doors. Not more than 3/4 inch at bottom.
  - a. Fire Doors: Provide clearances according to NFPA 80.
- B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel sheet.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- E. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch-thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
  1. At exterior locations and where indicated.
  2. Where indicated.
- F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- G. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
  1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
- H. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- I. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- J. Fabrication of Glass and Other Glazing Products

1. Fabricate glass and other glazing products in sizes required to glaze opening indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and reference glazing standard, to comply with system performance requirements.

## 2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication.

## 2.7 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with non-petroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
  1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
  1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

## 2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
  - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
  - 2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
  - 3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
  - 4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
  - 5. In in-place gypsum board partitions, install knock-down, slip-on, drywall frames.
  - 6. Install fire-rated frames according to NFPA 80.
- C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
  - 1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
  - 2. Smoke-Control Doors: Comply with NFPA 105.
- D. Glazing. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

### 3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

- C. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08110



## SECTION 08305 - ACCESS DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following types of access doors:
  - 1. Wall access doors.
  - 2. Fire-rated wall access doors.
  - 3. Ceiling access doors.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 07720 "Roof Accessories" for roof hatches.
  - 2. Section 08710 "Door Hardware" for mortise or rim cylinder locks.
  - 3. Section 09255 "Gypsum Board Assemblies" for gypsum board walls and ceilings.
  - 4. Section 09300 "Tile" for ceramic tile walls.
  - 5. Section 15910 "Duct Accessories" for duct access doors.

#### 1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. A 366 Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
  - 2. A 591 Specification for Steel Sheet Electrolytic Zinc-Coated, for Light Coating Mass Applications.
  - 3. E 119 Methods for Fire Tests of Building Construction and Materials.
  - 4. E 152 Methods for Fire Tests of Door Assemblies.

#### 1.3 SUBMITTALS

- A. Product data for each type of access door assembly specified, including details of construction relative to materials, individual components, profiles, finishes, and fire-protection ratings (if required).
  - 1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, latching or locking provisions, and other data pertinent to installation.

- B. Shop drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage, and accessory items.
- C. Samples, 3-inch by 5-inch minimum size, of each panel face material showing factory-finished color and texture.

#### **1.4 QUALITY ASSURANCE**

- A. Single-Source Responsibility - Obtain access doors for entire Project from one source and by a single manufacturer.
- B. Fire-Rated Door Assemblies - Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per test method as indicated below, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Test Method for Vertical Installations - ASTM E 152.
  - 2. Test Method for Horizontal Installations - ASTM E 119.
- C. Size Variations - Obtain COR's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

#### **1.5 COORDINATION**

- A. Verification - Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified under "Submittals" Article.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Known Acceptable Source - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Karp Associates, Inc.

#### **2.2 MATERIALS**

- A. Steel Sheet - ASTM A 366 commercial-quality, cold-rolled steel sheet with baked-on, rust-inhibitive primer.
- B. Zinc-Coated Steel Sheet - ASTM A 591 Electrolytic zinc-coated steel sheet with Class C coating and phosphate treatment to prepare surface for painting.

## 2.3 ACCESS DOORS

- A. Insulated, Fire-Rated Access Doors - Self-latching units consisting of frame, trim, door, insulation, and hardware, including automatic closer, interior latch release, and complying with the following requirements:
  - 1. Frame with Exposed Trim - Perimeter frame with integral exposed trim complying with the following requirements:
    - a. Metal - 0.0598-inch- thick steel sheet.
    - b. Trim - 1-inch flange overlapping surfaces surrounding door frame.
  - 2. Door - 0.0359-inch- thick steel sheet, welded pan type.
  - 3. Hinges - Continuous type.
  - 4. Latches - Bolt type, operated by either a ring turn or flush key device (keyed alike).
  - 5. Insulation - 2-inch- thick mineral-fiber insulation.
  - 6. Fire-Protection Rating for Walls - 1-1/2 hours.
- B. Flush Access Doors with Exposed Trim - Units consisting of frame with exposed trim, door, hardware, and complying with the following requirements:
  - 1. Frame - 0.0747-inch-thick steel sheet.
  - 2. Door - 0.0747-inch- thick steel sheet.
  - 3. Trim - Flange integral with frame, 3/4 inch wide, overlapping surrounding finished surface.
  - 4. Hinge - Continuous type.
  - 5. Locks - Key-operated cylinder lock.
- C. Trimless, Flush Access Doors for Gypsum Board - Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:
  - 1. Frame - 0.0747-inch-thick steel sheet.
  - 2. Door - 0.0747-inch- thick steel sheet.
  - 3. Concealed, Gypsum Board Edge Trim - 0.0299-inch zinc-coated or galvanized-steel sheet with face flange formed to receive joint compound.
  - 4. Hinge - Concealed spring pin or continuous type.
  - 5. Locks - Key-operated cylinder lock.

## 2.4 FABRICATION

- A. General - Manufacture each access door assembly as an integral unit ready for installation.
- B. Steel Access Doors and Frames - Continuous welded construction. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flange - Nominal 1 to 1-1/2 inches wide around perimeter of frame.
  2. For gypsum board assemblies or gypsum veneer plaster, furnish frames with edge trim for gypsum board or gypsum base.
  3. For full-bed plaster applications, furnish frames with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
  4. For installation in masonry construction, furnish frames with adjustable metal masonry anchors.
- C. Locking Devices - Furnish number required to hold door in flush, smooth plane when closed.
1. For cylinder lock, furnish 2 keys per lock and key all locks alike.
  2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Advise Installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

#### 3.2 INSTALLATION

- A. Comply with manufacturer's instructions for installing access doors.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.
- C. Install concealed-frame access doors flush with adjacent finish surfaces.

#### 3.3 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08305

SECTION 08510 - EXTERIOR SECURITY ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section consists of furnishing and installing exterior security windows and glazing.
- B. Related Sections - The following sections contain requirements that relate to this Section:
  - 1. Section 05500 "Metal Fabrications"
  - 2. Section 06105 "Miscellaneous Carpentry"
  - 3. Section 07620 "Flashing and Sheet Metal"
  - 4. Section 07920 "Joint Sealants"
  - 5. Section 09255 "Gypsum Board Assemblies"

1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. C236 Standard Test Methods for Steady-State Thermal Performance for Building Assemblies by Means of a Guarded Hot Box.
  - 2. C509 Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
  - 3. C1036 Standard Specification for Flat Glass.
  - 4. C1048 Standard Specification for Heat-Treated Flat Glass.
  - 5. D2000 Standard Classification System for Rubber Products in Automotive Applications.
  - 6. D2287 Standard Specification for Non-rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.
  - 7. E 331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Wall, and Doors by Uniform Static Air Pressure Difference.

1.3 PERFORMANCE REQUIREMENTS

- A. General - Provide exterior security aluminum windows and glazing in accordance with performance characteristics and details on Contract Drawings.
- B. Design Requirements - Comply with structural performance, air infiltration, water penetration and thermal performance requirements indicated.
  - 1. Testing - Test each type and size of required window unit through a recognized independent testing laboratory or agency for compliance with specified performance requirements.
  - 2. Structural Performance - Provide security window units to resist a minimum of 3 psi at 24 ms for a one-time event. Design and test the frame and anchorage to meet this requirement by testing the manufacturer's stock assemblies according to test methods

indicated or supported by calculations performed by an independent engineering firm recognized for similar security work.

3. Water Penetration - Provide units with no water penetration as defined in the test standard at an inward test pressure of 2.86 lbf per sq. ft., when tested in accordance with ASTM E 331.
4. Thermal Performance - Provide units that are thermally improved for a condensation resistance factor (CFR) of Class C55, of better, per ASTM C236. Average ( Summer and Winter) U-value for units shall not be more than 0.55 Btu/sq. ft. x h x deg F.

#### 1.4 SUBMITTALS

A. Product data, including -

1. Construction details and fabrication methods.
2. Profiles and dimensions of individual components.
3. Data on accessories, finishes, and hardware.
4. Test results or calculations to meet the design requirement.
5. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop drawings - Include information not fully detailed in manufacturer's standard product data and the following:

1. Layout and installation details, including anchors, shims, and relationship to adjacent work.
2. Elevations of continuous work at 1/4 inch = 1 foot scale and typical window unit elevations at 3/4 inch = 1 foot scale.
3. Full-size section details of typical composite members, including reinforcement.
4. Accessories.
5. Glazing details.
6. Location of weep holes or weep tubes.

C. Samples for Initial Color Selection - Submit samples of each specified finish on 12-inch long sections of window members.

D. Samples for Verification Purposes - The COR reserves the right to require additional samples that show fabrication techniques and workmanship, and design of hardware and accessories.

E. Test or Calculation Reports - Provide certified test reports from a qualified independent testing laboratory showing that the windows have been tested and comply with performance characteristics indicated or supported by calculations performed by an independent engineering firm recognized for similar security work.

#### 1.5 QUALITY ASSURANCE

A. Installer Qualifications - Engage an experienced installer who has completed installation of security window units similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.

- B. Single Source Responsibility - Provide security aluminum windows produced by a single manufacturer capable of showing prior production of units similar to those required.
- C. Design Concept - The drawings indicate the size, profiles and dimensional requirements of the aluminum window types required and are based on the design requirement indicated.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver security aluminum window system components in the manufacturer's original, unopened protective packaging. Store components in a clean, dry location away from uncured masonry or concrete in weatherproof covering but in a manner to permit air circulation and ventilation.
- B. Stack window components in a manner that will prevent bending and permanent damage.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements - Check actual window openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.
  - 1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit of window units.

#### 1.8 SEQUENCING AND SCHEDULING

- A. Scheduling - Schedule exterior siding and flashing work to accommodate the installation of the windows.

#### 1.9 WARRANTY

- A. Window Warranty - Submit a written warranty, executed by the window manufacturer and installer, agreeing to repair or replace window units that fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:
  - 1. Structural failures including excessive deflection, excessive leakage or air infiltration.
  - 2. Deterioration of metals, metal finishes and other materials beyond normal weathering.
- B. Warranty Period - 3 years after the date of Substantial Completion.
- C. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Known acceptable source:

1. NS7100 - Aluminum as manufactured by Norshield Security Products, Montgomery, AL. (334) 281-8440.

## 2.2 MATERIALS

- A. Aluminum Window Members - Aluminum extrusions shall be extruded from 6063-T6 alloy or equal with aluminum tensile strength (minimum 35.0 ksi ultimate, 32.0 ksi yield). Extruded aluminum frames shall be thermally broken with the interior portion of the frame insulated from the exterior portion.
- B. Fasteners - Fastener requirements listed below are applicable to screws, bolts, nuts, washers, rivets, and pins.
  1. Fasteners outboard of or within a glazing pocket, gutter, finished cavity, or other potentially wet location (after completion of construction) shall be stainless steel type 302 or 304. Fasteners inboard of potentially wet locations shall be stainless steel type 302 or 304, cadmium plated carbon steel, or zinc plated carbon steel.
  2. Provide lock washer or other locking device at all bolted connections.
  3. Powder actuated fasteners are not acceptable.
  4. Where fasteners screw-anchor into aluminum members less than 0.125 inch thick, reinforce the interior with non-magnetic stainless steel to receive screw threads.
  5. Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat head machine screws that match the finish of member or hardware being fastened.
- C. Shims - At connections subject to movement, separate all pairs of moving surfaces with friction reducing pads. Pads shall have a minimum 0.125 inch thickness and shall be positively retained in position (open ended slots are not acceptable).
  1. Shims which transfer shear forces (tending to slide one shim against another) shall be steel plates, set in a staggered pattern and fillet welded to each other and to the adjacent steel surfaces. The shims and welds shall be structurally designed to support the applied loads.
  2. Plastic shims are acceptable at static connections for which the shims transfer only compressive forces. Wood shims are not acceptable.
- D. Sealants -
  1. Products -
    - a. Acceptable products for non-structural seals to substrates other than stone are: General Electric; 790 and 795, Dow Corning; Spectrum 1 and 2, Tremco.
    - b. Acceptable products for structural seals are: 795 and 983, Dow Corning; Proglase II, Tremco; SSG 4000 and SSG 4200, General Electric. Products requiring mixing of components are acceptable only for shop application with mixing and applying.
    - c. Data sheets and samples may be submitted for consideration of other sealants, which are subject to approval. Oil base sealants are not acceptable.
  2. General Requirements -



- a. For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic, non-shrinking, and non-migrating. Comply with Section 07920, "Joint Sealants" of these specifications for selection and installation of sealants. Comply with the printed instructions and recommendations of the sealant manufacturer regarding joint size limitations, mixing, priming, and application. Unless printed instructions advise to the contrary, do not apply sealants when substrates are wet or when the temperature is below 40 degrees F.
  - b. Sealant backup materials shall be polyethylene foam, urethane foam, or extruded silicone as recommended by sealant manufacturer.
  - c. All sealant shall be tooled as a separate operation after application.
  - d. Coordinate with other sections to ensure compatibility of intersecting sealants.
- E. Anchors, Clips and Window Accessories - Provide Rawl or equivalent expansion anchors.
- F. Compression-Type Glazing Strips and Weather-stripping - Provide compressible stripping for glazing and weather-stripping such as molded EPDM or neoprene gaskets complying with ASTM D 2000, Designation 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D 2287, or molded expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.
- G. Glass and Glazing Materials - Provide sealed insulating glass units consisting of a tinted outer pane and a clear inner pane with a hermetically sealed air cavity. Low-E coat surface Number 2 or 3. Tint glass grey with a shading coefficient between 0.51 to 0.57. Provide glass that is laminated and thermally tempered. Thickness shall be determined by calculation based on the Design Requirements identified within the PERFORMANCE REQUIREMENTS paragraphs for the windows. The glass shall meet minimum requirement as specified in ASTM C1036 or C1048.

## 2.3 ACCESSORIES

- A. Weather-stripping - Provide the manufacturer's standard weather-stripping, of materials specified, applied to inside metal contact line of each operating sash or vent.

## 2.4 FABRICATION

- A. General - Fabrication aluminum security window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of security window units for the indicated design requirements.
- B. Prefabrication - Complete fabrication, assembly, finishing, and other work to the greatest extent possible before shipment to the project site. Disassemble components only as necessary for shipment and installation. Typical fixed modules shall be completely prefabricated, shop assembled and shop finished.

- C. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Pre-assemble framing into prefabricated units and shop glaze insofar as practicable.
- D. Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.
- E. Reinforcing - Install reinforcing as required for hardware, and as necessary for performance requirements, sag resistance, and rigidity.
- F. Dissimilar Metals - Separate dissimilar metals with bituminous paint, or a suitable sealant, or a non-absorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.
- G. Continuity - Maintain accurate relation of planes and angles with hairline fit of contacting members.
- H. Uniformity of Metal Finish - Abutting extruded aluminum members shall not have an integral color or texture variation greater than half the range indicated in the sample pair submitted.
- I. Fasteners - Conceal fasteners wherever possible. Exposed fasteners shall not be allowed at typical frame conditions.

## 2.5 FINISHES

- A. Protect shop finishes from damage due to shipping, handling, and exposures prior to application of field finish or prior to time of substantial completion where shop finish is the final finish.
- B. Exterior and Interior exposed aluminum surfaces shall comply with AAMA A44, anodized dark bronze 0.17 mil thickness.
- C. Color shall match approved samples. Samples shall show extremes of color range.
- D. Fixed touchup of painted aluminum is permitted only with written permission from the COR. Unless touchup is authorized, replace damaged material with new material.
- E. Warranty: Color changes shall not exceed 5E NBS units as defined by ASTM D2244 for the specified special warranty period. Chalking shall not exceed a number 8 rating for colors and a number 6 rating for whites as defined by ASTM D659 for the specified special warranty period. Paint film shall not crack or peel during the specified special warranty period.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. With installer present, examine and verify support system for compliance with indicated requirements, installation tolerances, and other conditions that affect installation of exterior

security windows. Do not proceed with the installation until unsatisfactory conditions are corrected to the satisfaction of COR. Inspect openings before beginning installation. Verify that rough openings are correct and the sill plate is level. Wall surfaces shall be visibly dry and free of construction debris.

### 3.2 INSTALLATION

- A. Comply with design requirements indicated and manufacturer's recommendations for installation of window units, hardware, operators, and other components of the work.
- B. Set window units plumb, level and true to line, without warp or rack of frames.
- C. Set sill members and other members in a bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction. Refer to Section 07920, "Joint Sealants" for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.
  - 1. Seal exterior joints between sash, trim and mullions watertight with sealant.
  - 2. Compounds, joint fillers, and gaskets to be installed after installation of window units are specified as work in Section 07920, "Joint Sealants."
  - 3. Repair abraded areas of factory applied finishes.
- D. Construction Tolerances - Install aluminum windows to comply with the following tolerances:
  - 1. Variation from Plane - Do not exceed 1/8 inch in 12 feet of length, or 1/4 inch in any total length.
  - 2. Offset from Alignment - The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
  - 3. Diagonal Measurements - The maximum difference in diagonal measurements shall not exceed 1/8 inch.
  - 4. Offset at Corners - The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.

### 3.3 ADJUSTING

- A. Adjust to provide a tight fit at contact points and weather-stripping, for a weathertight closure.

### 3.4 CLEANING

- A. Clean the completed system, inside and out, promptly after installation of windows. Exercise care to avoid damage to the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
- B. Clean glass of pre-glazed units promptly after installation of windows.

### 3.5 PROTECTION

- A. Initiate and maintain protection and other precautions required through the remainder of the construction period, to ensure that, except for normal weathering, window units will be free of damage or deterioration at the time of Substantial Completion.

END OF SECTION 08510

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide labor, materials, and equipment for door hardware, including but not limited to the following:
  - 1. Finish Hardware.
  - 2. Thresholds, Gasketing and Weatherstripping.
- B. Products furnished but not installed under this Section include:
  - 1. Final replacement cores and keys to be installed by Government.
- C. Related Sections
  - 1. Hardware for accordeon folding partitions is specified in Section 10655.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
  - 1. A 117.1 Building and Facilities - Providing Accessibility and Usability for Handicapped People.
  - 2. A 156 Series for Door Hardware.
- B. Door and Hardware Institute (DHI)
- C. National Fire Protection Association (NFPA)
  - 1.80 Fire Doors and Windows
  - 2.101 Life Safety Code
- D. Underwriters Laboratories, Inc. (UL)

1.3 SUBMITTALS

- A. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- B. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content - Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
    - a. Type, style, function, size, and finish of each hardware item.
    - b. Name and manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for hardware.
    - g. Door and frame sizes and materials.
    - h. Keying information.
  2. Submittal Sequence - Submit initial draft of final schedule along with essential product data in order to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit final schedule after samples, product data, coordination with shop drawings of other work, delivery schedules, and similar information has been completed and accepted.
  3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Government's final instructions on keying of locks has been fulfilled.
- C. Samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.
1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.
- D. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
1. The submission for templated and template list shall follow the procedure as set forth in the D.H.I. publication "For Processing Hardware Schedules and Templates."

#### 1.4 QUALITY ASSURANCE

- A. Single Source Responsibility - Obtain each type of hardware, such as latch and lock sets, hinges, and closers, from a single manufacturer.
- B. Supplier Qualifications - A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Government, COR, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with COR to finalize keying requirements and to obtain final instructions in writing.
- C. Fire-Rated Openings - Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to COR for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
- D. Quality levels of hardware are established by manufacturers' names and model numbers. Certain products are specified without substitution and shall be provided .

#### 1.5 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

#### 1.6 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Government's continued adjustment, maintenance, and removal and replacement of door hardware.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Provide hardware that complies with barrier-free facilities design standards, such as:
  1. Knob/Lever Heights
  2. Knurled Knobs/Levers

3. Closer Opening Face
4. Push, Pull and Kick Plates Height
5. Threshold Elevations and Slope

## 2.2 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following.
- B. ANSI/BHMA designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.

Butts and Hinges - ANSI A156.1 (BHMA 101)  
Locks & Lock Trim - ANSI A156.2 (BHMA 601)  
Exit Devices - ANSI A156.3 (BHMA 701)  
Door Controls-Closers - ANSI A156.4 (BHMA 301)  
Auxiliary Locks - ANSI A156.5 (BHMA 501)  
Architectural Door Trim - ANSI A156.6 (BHMA 1001)  
Template Hinge Dimensions - ANSI A156.7  
Door Controls- Overhead Holders - ANSI A156.8 (BHMA 601)  
Interconnected Locks & Latches - ANSI A156.13 (BHMA 621)  
Mortise Locks & Latches - ANSI A156.13 (BHMA 621)  
Closer Holder Release Devices - ANSI A156.15 (BHMA 321)  
Auxiliary hardware - ANSI A156.16 (BHMA 1201)  
Materials & Finishes - ANSI A156.18 (BHMA 1301)

## 2.3 MATERIAL AND FABRICATION

- A: Hand of door - Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- B. Manufacturer's Name Plate - Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location. Remove removable nameplates, except in conjunction with required UL labels and as otherwise acceptable to COR. Manufacturer's identification will be permitted on rim of lock cylinders only.
- C. Base Metals - Produce hardware units of base metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods without written approval from COR.
- D. Fasteners - Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.



- E. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws typically, except as otherwise indicated. Exposed fasteners shall match hardware finish or, if exposed in surfaces of other work, shall match Work as closely as possible.
- F. Provide concealed fasteners for hardware units which are exposed when door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through-bolts for installation where bolts head or nut opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. Where through-bolts cannot be avoided, provide sleeves for each through-bolt or use sex screw fasteners.
- G. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Government's continued adjustment, maintenance, and removal and replacement of finish hardware.
- H. Electro-Magnetic Items - Closers, strikes, hinges and other electro-magnetic hardware items shall be fail-safe unless otherwise specifically identified as fail-secure.

## 2.4 FINISHED HARDWARE CRITERIA

### A. Hinges And Butts -

- 1. Templates - Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- 2. Screws - Furnish Phillips flat-head or machine screws for installation of units. Finish screw heads to match surface of hinges or pivots.
- 3. Hinges Pins - Except as otherwise indicated, provide pin as follows:
  - a. Steel Hinges - Steel pins
  - b. Non-ferrous Hinges - Stainless steel pins for wet areas and exterior doors.
  - c. Exterior Doors - Non-removable pins.
  - d. Out-swing Corridor Doors - Non-removable pins.
  - e. Interior Doors - Non-rising pins.
  - f. Tips - Flat button and matching plug, finished to match leaves.
  - g. Number of hinges - Typically, provide not less than 3 hinges per door leaf for doors 7 feet - 6 inches or less in height and one additional hinge for each 30 inches of additional height. Provide additional hinges where scheduled.

### B. Lock Cylinders And Keying

- 1. Standard System - Provide new masterkey and grand masterkey system for Project in compliance with COR requirements.
- 2. Equip locks with manufacturer's standard 7-pin tumbler cylinder as available from Best Lock Company. No substitutions will be permitted.
- 3. Metals - Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
- 4. Comply with COR's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
- 5. Key Material - Provide keys of nickel silver only.

6. Key Quantity - Furnish 3 change keys for each construction code.
  - a. Furnish one extra blank for each lock.
  - b. Deliver keys to COR.
  - c. Final keying will be completed by the Government.
7. Electric Locking and Unlocking – Provide electric mortise lock device controlled by a remote switching device, an access control system or an automatic fire alarm system. Field reversible handing with 24 DVC continuous duty solinoid.
8. Key Control System - Provide envelopes, labels, tags, self-locking key clips, receipt forms, 3-way visible card index, temporary marker, permanent marker, and standard metal cabinet, in accordance with written recommendations of the system manufacturer, with capacity for 150% of the number of locks required for the Project.
  - a. Provide complete cross index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final key schedule.

C. Locks, Latches And Bolts

1. Strikes - Provide Manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.
2. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.
3. Provide roller type strike where recommended by manufacturer of the latch and lock units.
4. Lock Throw - Provide 3/4 inch minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of deadbolts and latchbolts at rated fire openings.
5. Provide 3/4 inch minimum throw on other latch and deadlock bolts.
6. Flush Bolt Heads - Minimum of 1/2 inch diameter rods of brass, bronze or stainless steel, with minimum 12 inch long rod for doors up to 7'-0" high. Provide longer rods as necessary for doors exceeding 7'-0" in height.
7. Exit Devices Dogging - At typical, non-fire-rated door assemblies, equip closers with keyed dogging device to hold the push bar down and the latch bolt in the open position for doors with exit devices.
8. Rabbeted Doors - Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

D. Push/Pull Units -

1. Exposed Fasteners - Provide manufacturer's standard exposed fasteners for installation; thru-bolted for matched pairs, but not for single units

E. Closers And Door Control Devices -

1. Surface Applied Closer - Typically, provide parallel arms for overhead surface closers, except as otherwise indicated.

2. Size of Units - Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
3. Barrier-Free Manual Closers - UFAS-compliant; except where manual closers are specifically scheduled at doors identified as not required to be accessible to the physically disabled, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.
4. Combination Door Closers and Holders - Provide "Fail-safe" units designated to hold doors in open position under normal usage and to release and automatically close and latch door when Fire Alarm activates. Provide units with integral electromagnetic holder mechanisms, listed with UL for use with fire detector systems and provided with normally closed switching contacts. Coordinate and connect mechanisms with Work of Division 16 for release of hold open devices by fire detector and alarm systems.

F. DOOR TRIM UNITS -

1. Fasteners - Provide manufacturer's standard exposed fastener for door trim units with either machine screws or self-tapping screws.
2. Fabricate protection plates (armor, kick or mop) not more than 2 inches less than door width on stop side and not more 1/2 inch less than door width on pull side, X the height indicated. Protection plates shall be beveled three (3) sides. Metal Plates: Stainless Steel, .050 inch (U.S. 18 ga.)

	<u>Height (inches)</u>		<u>Door Width (DW)</u>
Kickplate	8	x	DW Scheduled
Armor	48	x	DW Scheduled
Mop	4	x	DW Scheduled

2.5 FINISH HARDWARE DATA

- A. Materials - The following model numbers correspond to specifications in the catalogs of the manufacturers listed below to establish known acceptable sources.

<u>Class/Description</u>	<u>Listed MFGR</u>	<u>Approved Substitutes</u>
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B. HANGING DEVICES

Hinges	McKinney	Stanley	Hager
	T2314 4.5x4.5	F191 4.5x4.5	1191 4.5x4.5
	TB2314 4.5x4.5	FBB191 4.5x4.5	BB1191 4.5x4.5
	T4B3386 4.5x4.5	FBB199 4.5x4.5	BB1199 4.5x4.5

C. SECURING DEVICES

Latch	Best
	35H-Nx15H
	93K-Nx15D

Lock	93K-7Dx15D 93K-7Rx15D	Von Duprin E9975	
Flush Bolts -	Rockwood 555 1842	Ives 458 559	Hager 282D 292D
D. ACCESSORIES FOR PAIRS			
Coordinators	DORMA SR405	DCI 672	Rockwood 1672
E. CLOSING DEVICES			
Closer	DORMA 7801 R 7801 PA 7801 HO 7801 PAHO	LCN 4040 R 4040 PA 4040 H 4040 PA	Sargent 350 0 350 P9 350 H 350 PH9
F. PROTECTIVE PLATES/TRIM			
Kick Plate	Rockwood	Ives	Hager
G. STOPS/HOLDERS			
Stop	Rockwood 441	Trimco 1211ES	Hager 241F
OH Stop/Holder	DORMA 710S	Rixson 3-131	Glynn-Johnson 310
H. ACCESSORIES			
Weather-strip	Pemko 171A 303V 319N S88	Nat'l Guard 425 160 137N 5050	Hager 412S 891SV 878SN 736S
I. MISCELLANEOUS			
Silencers	Rockwood 608	Ives 20	Hager 307D
J. FINISHES - Unless noted otherwise in the Hardware Sets scheduled, hardware finishes shall be as follows:			

Hinges	630
Locks/Latch Sets	630
Flush Bolts	630
Push/Pulls	630
Surface Closers	646
Plates	630
Stops	626
Weatherstrip	689
Silencers	Gray

- K. KEYING - Consult with the COR and obtain written approval of the complete keying system for the entire facility prior to placing lock order with the factory.

### PART 3 - EXECUTION

#### 3.1 INSPECTION

- A. After installation has been completed, the finished hardware supplier shall have a qualified hardware consultant check the job and do a final inspection to determine that the doors and frames were prepared properly to receive the hardware. The inspection shall also determine that the proper hardware was used on each opening according to the approved hardware schedule.
- B. The final inspection shall determine that hardware was installed according to the manufacturer's recommended instructions. Adjust hardware which is not operating properly.

#### 3.2 INSTALLATION

- A. The mounting heights for the finishing hardware shall be as listed in the DHI Publication "Recommended Locations for Builders Hardware For Custom Steel Door and Frames."
- B. The handling of doors shall be as listed in the Finish Hardware Schedule and shall follow the DHI Publication "Basic Builders Hardware".
- C. The finish hardware installer shall be skilled and qualified in the installation of contract builders hardware.

#### 3.3 ADJUSTING AND CLEANING

- A. Hardware shall be left clean and free from disfigurement, at final completion. The Contractor shall make final adjustment to all door closers and other hardware items. Defective or damaged items shall be repaired or replaced.

#### 3.4 PROTECTION

- A. Provide proper protection for the hardware and finish until time of Substantial Completion of the Project.

#### 3.5 FINISH HARDWARE SCHEDULE

- A. Provide finish hardware as scheduled below. Coordinate with the Door Schedule, issued on the Drawings. Hardware Schedule begins below and continues through "End of Section" designation.

HDW Set No. 1

Hinges, 4-1/2 x 4-1/2  
1 Each Lever Lockset, Type F84.  
1 Each Closer, Type C0201.  
1 Each Stop.

HDW Set No. 2

Hinges, 4-1/2 x 4 1/2  
1 Each Lever Lockset, Type F84.  
2 Each Closer, Type C02021.  
1 Each Coordinator  
Flush Bolts and Strike (inactive leaf).  
Astragal.  
2 Each Stops

HDW Set No. 3

Hinges, 4-1/2 x 4 1/2, Electric Power Transfer  
1 Each Lever Lockset, Type F84.  
1 Each Closer, Type C02021.  
1 Each Flat Threshold.  
1 Each Fire Exit Mortise Lock Device, Type E9975  
Perimeter Seals.  
Door Sweep Strip.  
1 Each Stop

HDW Set No. 4

Hinges, 4-1/2 x 4 1/2  
1 Each Lever Latchset, Type F75  
1 Each Closer, Type C02011  
1 Each Stop

HDW Set No. 5

Hinges, 4-1/2 x 4 1/2  
1 Each Lever Lockset, Type F86  
1 Each Closer, Type C02011  
1 Each Stop

HDW Set No. 6

Hinges, 4-1/2 x 4-1/2  
1 Each Lever Lockset, Type F84  
2 Each Closer, Norton 8000PT or Equal  
1 Each, Coordinator  
Flush Bolts and Strike (Inactive Leaf)  
Astragal  
2 Each, Stops

END OF SECTION 08710

## SECTION 08830 - MIRRORED GLASS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Safety (tempered) glass mirrors.
- B. Metal-framed mirror units are specified in Section 10800, "Toilet and Bath Accessories".

#### 1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. C 1048 Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
- B. American National Standards Institute (ANSI)
  - 1. Z 97.1 Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. Flat Glass Marketing Association (FGMA)
- D. National Association of Mirror Manufacturers (NAMM)

#### 1.3 SUBMITTALS

- A. Product data for each type of product specified including description of materials and process used to produce mirrored glass, including source of glass, glass coating components, edge sealer, and quality control provisions.
- B. Samples, 12 inches (300 mm) square in size, of each type of mirrored glass specified, including edge treatment on 2 adjoining edges of samples.
- C. Product certificates signed by manufacturers of mirrored glass certifying that their products and edge sealers comply with specified requirements.
- D. Mirror mastic glass coating compatibility test reports from organic protective coating manufacturer indicating that mirror mastic has been tested for compatibility and adhesion with organic protective coating. Include organic coating manufacturers' interpretation of test results relative to performance and recommendations for use of mastics with organic protective coating.



#### 1.4 QUALITY ASSURANCE

- A. Glazing Standards - Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" except where more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or referenced standards.
- B. Mirror Manufacturers' Document - Comply with recommendations of National Association of Mirror Manufacturers (NAMM) in its publication "MIRRORS, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors."
- C. Safety Glass Standard - Where safety glass mirrors are indicated or required by authorities having jurisdiction, provide products of type indicated that comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
- D. Single-Source Responsibility - Provide products obtained from one source for each type of mirror indicated.
- E. Preconstruction Mirror Mastic Glass Coating Compatibility Test - Submit mirror mastic products to manufacturer of protective organic coating for testing by coating manufacturer's standard test method to determine compatibility of adhesive with mirrored glass coating.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions for shipping, storing, and handling mirrored glass; avoid deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Conditions - Do not proceed with mirrored glass installation until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. American Mirror Co.
  - 2. Bassett Mirror Co.
  - 3. Consolidated Glass & Mirror Corp.

#### 2.2 GLASS FOR MIRROR PRODUCTION

- A. Tempered Glass - Tempered float glass manufactured by horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated, complying with ASTM C 1048 for Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent, flat), Quality q3 (glazing select), and for class indicated below:

- 1. Clear Tempered Float Glass - Class 1 (clear).

## 2.3 MIRRORED GLASS PRODUCTION AND FABRICATION

- A. Glass Coating - Coat second surface of glass with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard protective organic coating to produce coating system that complies with FS DD-M-0041, except with salt-spray test period extended to 300 hours and undercutting, discoloration, blackening, and silver impairment at mirror edges not greater than 1/8 inch (3 mm).

- B. Mirror Sizes - After application of glass coating, cut mirrored glass to final sizes and in the following nominal glass thickness:

- 1. Thickness - 5 mm.

- C. Mirror Edge Treatment - Provide forms of edge treatment indicated below, with edges sealed after treatment to prevent chemical or atmospheric penetration of glass coating:

- 1. Rounded polished edge.

## 2.4 MISCELLANEOUS MATERIALS

- A. Setting Blocks - Neoprene, 70 - 90 Shore A hardness.

- B. Edge Sealer - A coating that has proven to be compatible with glass coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirror edges.

- C. Mirror Mastic - An adhesive setting compound, produced specifically for setting mirrors by spot application, certified as compatible with glass coating by organic protective coating manufacturer and approved by mirror manufacturer.

- D. Mirror Hardware - Extruded aluminum mirror hardware, of size and profile indicated, in manufacturer's standard finish, complying with description below:

- 1. Clear anodized finish.

- E. Fasteners - Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture.

- F. Anchors and Inserts - Provide devices as required for installation of mirror hardware. Provide toothed or lead-shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for applications on inside face of exterior walls and where indicated.

### PART 3 - EXECUTION

#### 3.1 GLAZING

- A. General - Install mirrors to comply with printed directions of mirror manufacturer, and with referenced FGMA standard and NAMM document. Mount mirrors in place to avoid distorting reflected images and provide space for air circulation between back of mirror and face of mounting surface.
- B. Mastec Spot Installation System - Install mirrors with mastec as follows:
  - 1. Identify and examine surfaces over which mirror is to be mounted. Comply with manufacturer's printed installation directions for preparation of mounting surfaces including coating surfaces with mastec manufacturer's special bond coating where applicable.
  - 2. Apply barrier coat to mirror backing where approved by manufacturers of mirror and backing material.
  - 3. Apply mastec in spots to comply with mastec manufacturer's printed directions for coverage and to allow air circulation between back of mirror and face of mounting surface.
  - 4. After mastec is applied, align mirror and press into place while maintaining a minimum air space of 3/16 inch (5 mm) between back of mirror and mounting surface.
  - 5. For wall-mounted mirrors install permanent means of support at bottom and top edges with bottom support designed to withstand mirror weight and top support to prevent mirror from coming away from wall along top edges.
    - a. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable.
    - b. For continuous bottom supports, provide 1/8 x 4-inch (3 x 100-mm) setting blocks at quarter points.
    - c. For wall application provide clips along top of mirror.

#### 3.2 PROTECTION AND CLEANING

- A. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirror to be exposed to standing water.
- C. Maintain environmental conditions that will prevent mirror from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Wash mirrors not more than 4 days prior to date scheduled for inspections intended to establish date for Substantial Completion. Wash glass by methods recommended in NAMM document and by mirrored glass manufacturer. Use water or glass cleaners free from substances capable of damaging mirror edges or glass coating.

END OF SECTION 08830

# **DIVISION 9**

## **FINISHES**

SECTION 09255 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Non-load-bearing steel framing members for interior gypsum board assemblies.
2. Gypsum board assemblies attached to steel framing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05400 "Cold-Formed Metal Framing" for non-load-bearing steel framing.
2. Section 06105 "Miscellaneous Carpentry" for gypsum sheathing applied over wood framing.
3. Section 07251 "Sprayed-on Fireproofing" for fireproofing structural steel members concealed behind gypsum board assemblies.
4. Section 07270 "Fire-Stopping" for fire-stopping systems and fire-resistance-rated joint sealants.
5. Section 09263 "Gypsum Board Shaft-Wall Assemblies" for framing, gypsum panels, and other components forming shaft wall assemblies.
6. Section 09300 "Tile" for cementitious backer units installed as substrates for ceramic tile.

1.2 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1. A 108.11 Specifications for Interior Installation of Cementitious Backer Units.

B. American Society for Testing and Materials (ASTM)

1. A 568 Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements.
2. A 641 Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. A 653 Specification for Steel Sheet, Zinc-Coated (Galvannealed) by the Hot-Dip Process.
4. C 11 Terminology Relating to Gypsum and Related Building Materials and Systems.
5. C 36 Specification for Gypsum Wallboard.
6. C 475 Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
7. C 514 Specification for Nails for the Application of Gypsum Wallboard.
8. C 578 Specification for Rigid, Cellular Polystyrene Thermal Insulation.
9. C 630 Specification for Water-Resistant Gypsum Backing Board.
10. C 665 Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

11. C 754 Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
12. C 834 Specification for Latex Sealing Compounds.
13. C 840 Specification for Application and Finishing of Gypsum Board.
14. C 919 Practices for Use of Sealants in Acoustical Applications.
15. C 954 Specification for Steel Drill Screws for the Application for Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 in (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
16. C 1002 Specification for Steel Drill Screws for Application of Gypsum Board or Metal Plaster Bases.
17. C 1047 Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
18. C 1178 Specification for Glass Mat Water-Resistant Gypsum Backing Board.
19. E 84 Test Method for Surface Burning Characteristics of Building Materials.
20. E 90 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
21. E 119 Method for Fire Tests for Building Construction and Materials.
22. E 413 Classification for Rating Sound Insulation.
23. E 488 Test Method for Strength of Anchors in Concrete and Masonry Elements.
24. E 1190 Test Methods for Strength of Powder-Actuated Fasteners Installed in Structural Members.

C. Gypsum Association (GA)

1. 214 Recommended Specification: Levels of Gypsum Board Finish.
2. 216 Recommended Specifications for the Application and Finishing of Gypsum Board.
3. 219 Recommendations for Installation of Steel Fire Door Frames in Steel Stud-Gypsum Board Fire-Rated Partitions.
4. 505 Gypsum Board Terminology.
5. 600 Fire Resistance Design Manual.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology - Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics - For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance - Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. Product Data for each type of product specified.

- B. Shop Drawings showing locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

#### 1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing - Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products - Obtain each type of gypsum board and other panel products from a single manufacturer.
- C. Single-Source Responsibility for Finishing Materials - Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- D. Fire-Test-Response Characteristics - Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
  - 1. Fire-Resistance Ratings - As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 3. Deflection and Fire-stop Track - Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.



- B. Room Temperatures - For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation - Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Known Acceptable Sources - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Steel Framing and Furring - Clark Steel Framing, Inc.
  - 2. Grid Suspension Assemblies - Armstrong World Industries, Inc.
  - 3. Gypsum Board and Related Products - USG, Company

### 2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General - Provide components complying with ASTM C 754 for conditions indicated.
- B. Cast-in-Place and Post-installed Anchors in Concrete - Anchors of type indicated below, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires, and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing according to ASTM E 488 conducted by a qualified independent testing agency.
  - 1. Chemical anchor.
  - 2. Expansion anchor.
- C. Powder-Actuated Fasteners in Concrete - Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190 conducted by a qualified independent testing agency.
- D. Wire Ties - ASTM A 641, Class 1 zinc coating, soft temper, 0.062 inch thick.
- E. Wire Hangers - ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- F. Hanger Rods - Mild steel and zinc coated or protected with rust-inhibitive paint.
- G. Flat Hangers - Mild steel and zinc coated or protected with rust-inhibitive paint.

- H. Angle-Type Hangers - Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch-thick galvanized steel sheet complying with ASTM A 653, G 90 coating designation, with bolted connections and 5/16-inch diameter bolts.
- I. Channels - Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch- wide flanges, and as follows:
  - 1. Carrying Channels - 2 inches deep, 590 lb./1000 feet, unless otherwise indicated.
  - 2. Furring Channels - 3/4 inch deep, 300 lb./1000 feet, unless otherwise indicated.
  - 3. Finish - ASTM A 653, G 60 hot-dip galvanized coating for framing for exterior soffits and where indicated.
- J. Steel Studs for Furring Channels - ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
  - 1. Thickness - 0.0329 inch, unless otherwise indicated.
  - 2. Depth - 2-1/2 inches, unless otherwise indicated.
  - 3. Protective Coating - Manufacturer's standard corrosion-resistant coating.
  - 4. Protective Coating - ASTM A 653, G 40 hot-dip galvanized coating for framing for exterior soffits and ceiling suspension members in areas within 10 feet of exterior walls.
- K. Steel Rigid Furring Channels - ASTM C 645, hat shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:
  - 1. Thickness - 0.0329 inch, unless otherwise indicated.
  - 2. Protective Coating - ASTM A 653, G 40 hot-dip galvanized coating.
- L. Steel Resilient Furring Channels - Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 653 or ASTM A 568 to form 1/2-inch- deep channel of the following configuration:
  - 1. Single- or Double-Leg Configuration - Asymmetric-shaped channel with face connected to a single flange by a single-slotted leg (web) or hat-shaped channel, with 1-1/2-inch-wide face connected to flanges by double-slotted or expanded-metal legs (webs).
- M. Grid Suspension System for Interior Ceilings - ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

## 2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

- A. General - Provide steel framing members complying with the following requirements:
  - 1. Protective Coating - ASTM A 653, G 40 hot-dip galvanized coating for framing members attached to and within 10 feet of exterior walls.

- B. Steel Studs and Runners - ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
  - 1. Thickness - 0.0329 inch as follows:
    - a. For head runner, sill runner, jamb, and cripple studs at door and other openings.
    - b. In locations to receive cementitious backer units.
    - c. Where indicated.
  - 2. Depth - 3-5/8 inches, unless otherwise indicated.
- C. Deflection Track - Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A 653 or ASTM A 568. Thickness as indicated for studs, and width to accommodate depth of studs, and of the following configuration:
  - 1. Top runner with 2-1/2-inch- deep flanges that either have V-shaped offsets that compress when pressure is applied from construction above or have slots 1 inch o.c. that allow fasteners attached to studs through the slots to accommodate structural movement by slipping.
    - a. Available Products - Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
      - 1) Superior Flex Track System (SFT); Delta Star, Inc.
      - 2) SLP-TRK; Metal-Lite, Inc.
- D. Deflection and Fire-stop Track - Top runner designed to allow partition heads to expand and contract with movement of structure above while maintaining continuity of the assembly. Comply with requirements of ASTM C 645 except configuration, of thickness indicated for studs and width to accommodate depth of studs indicated with flanges offset at midpoint to accommodate gypsum board thickness.
  - 1. Offset Configuration - Shadow-line design with offset projecting out from depth of stud.
  - 2. Available Product: Subject to compliance with requirements, a product that may be incorporated in the Work includes, but is not limited to, "Fire Trak" manufactured by Fire Trak Corp.
- E. Steel Rigid Furring Channels - ASTM C 645, hat-shaped, depth and minimum thickness of base (uncoated) metal as follows:
  - 1. Thickness - 0.0329 inch, unless otherwise indicated.
  - 2. Depth - 7/8 inch, unless otherwise indicated.
- F. Furring Brackets - Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

- G. Steel Resilient Furring Channels - Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 653 or ASTM A 568 to form 1/2-inch-deep channel of the following configuration:
  - 1. Single- or Double-Leg Configuration - Asymmetric-shaped channel with face connected to a single flange by a single-slotted leg (web) or hat-shaped channel, with 1-1/2-inch-wide face connected to flanges by double-slotted or expanded-metal legs (webs).
- H. Z-Furring Members - Manufacturer's standard Z-shaped furring members with slotted or non-slotted web, fabricated from steel sheet complying with ASTM A 653 or ASTM A 568; with a minimum base metal (uncoated) thickness of 0.0179 inch, face flange of 1-1/4 inch, wall-attachment flange of 7/8 inch, and of depth required to fit insulation thickness indicated.
- I. Steel Channel Bridging - Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch- wide flanges, 1-1/2 inches deep, 475 lb./1000 feet, unless otherwise indicated.
- J. Steel Flat Strap and Backing Plate - Steel sheet for blocking and bracing complying with ASTM A 653 or ASTM A 568, length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
  - 1. Thickness: 0.0329 inch unless otherwise indicated.
- K. Fasteners for Metal Framing - Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

## 2.4 GYPSUM BOARD PRODUCTS

- A. General - Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
  - 1. Widths - Provide gypsum board in widths of 48 inches.
- B. Gypsum Wallboard - ASTM C 36 and as follows:
  - 1. Type - Regular for vertical surfaces, unless otherwise indicated.
  - 2. Type - Type X where required for fire-resistance-rated assemblies.
  - 3. Type - Sag-resistant type for ceiling surfaces.
  - 4. Edges - Tapered.
  - 5.. Thickness - 5/8 inch unless otherwise indicated.
- C. Gypsum Board Base Layer(s) for Multi-layer Applications - Gypsum wallboard, ASTM C 36, and as follows:
  - 1. Type - Regular for vertical surfaces, unless otherwise indicated.
  - 2. Type - Type X where indicated or required for fire-resistance-rated assemblies.
  - 3. Type - Sag-resistant type for ceiling surfaces, unless otherwise indicated.

4. Edges - Manufacturer's standard
5. Thickness - 5/8 inch, unless otherwise indicated.

D. Water-Resistant Gypsum Backing Board - ASTM C 630 and as follows:

1. Type - Regular, unless otherwise indicated.
2. Type - Type X where required for fire-resistance-rated assemblies and where indicated.
3. Thickness - 5/8 inch, unless otherwise indicated.

E. Glass-Mat, Water-Resistant Gypsum Backing Board - ASTM C 1178, of type and thickness indicated below:

1. Type and Thickness - Regular, 1/2 inch thick, unless otherwise indicated.
2. Type and Thickness - Type X, 5/8 inch thick, where required for fire-resistance-rated assemblies and where indicated.
3. Available Product - Subject to compliance with requirements, a product that may be incorporated in the Work includes, but is not limited to, "Dens-Shield Tile Backer" manufactured by Georgia-Pacific Corp.

## 2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation – Corner bead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material - Formed metal complying with the following requirement:
  - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047 -
  - a. Corner bead on outside corners, unless otherwise indicated.
  - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
  - c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
  - d. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

B. Accessory for Curved Edges – Corner bead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curvature radius.

C. Accessories for Exterior Installations – Corner bead, edge trim, and control joints formed from rolled zinc complying with ASTM C 1047, in shapes indicated below by reference to Fig. 1 designations in ASTM C 1047.

1. Corner bead on outside corners, unless otherwise indicated.
2. Edge trim complying with shape LC-bead per Fig. 1, unless otherwise indicated.
3. One-piece control joint formed from rolled zinc with V-shaped slot and removable strip covering slot opening.

## 2.6 JOINT TREATMENT MATERIALS

- A. General - Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board - Paper reinforcing tape, unless otherwise indicated.
  - 1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Joint Tape for Cementitious Backer Units - As recommended by cementitious backer unit manufacturer.
- D. Setting-Type Joint Compounds for Gypsum Board - Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
  - 1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
  - 2. For pre-filling gypsum board joints, use formulation recommended by gypsum board manufacturer.
  - 3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
  - 4. For topping compound, use sandable formulation.
- E. Drying-Type Joint Compounds for Gypsum Board on interior - Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
  - 1. Ready-Mixed Formulation - Factory-mixed product.
    - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
    - b. Topping compound formulated for fill (second) and finish (third) coats.
    - c. All-purpose compound formulated for both taping and topping compounds.
- F. Joint Compound for Cementitious Backer Units - Material recommended by cementitious backer unit manufacturer.

## 2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints - Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Acoustical Sealant for Concealed Joints - Manufacturer's standard nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
- C. Available Products - Subject to compliance with requirements, acoustical sealants that may be incorporated in the Work include, but are not limited to, the following:
  1. Acoustical Sealant for Exposed and Concealed Joints -
    - a. PL Acoustical Sealant; ChemRex, Inc.; Contech Brands.
    - b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
    - c. SHEETROCK Acoustical Sealant; United States Gypsum Co.
  2. Acoustical Sealant for Concealed Joints -
    - a. BA-98; Pecora Corp.
    - b. Tremco Acoustical Sealant; Tremco, Inc.

## 2.8 MISCELLANEOUS MATERIALS

- A. General - Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Laminating Adhesive - Special adhesive or joint compound recommended for laminating gypsum panels.
- C. Spot Grout - ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- D. Fastening Adhesive for Metal - Special adhesive recommended for laminating gypsum panels to steel framing.
- E. Steel drill screws complying with ASTM C 1002 for the following applications:
  1. Fastening gypsum board to steel members less than 0.033 inch thick.
- F.. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.
- G.. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.
- H. Gypsum Board Nails - ASTM C 514.



- I. Foam Gaskets - Closed-cell vinyl foam adhesive-backed strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit metal stud size indicated.
- J. Sound-Attenuation Blankets - Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).
  - 1. Mineral-Fiber Type - Fibers manufactured from slag wool or rock wool.
- K. Thermal Insulation - Material indicated below, of thickness and width to fill voids formed by Z-furring members:
  - 1. Unfaced Mineral-Fiber Blanket Insulation - Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).
    - a. Mineral-Fiber Type - Fibers manufactured from glass.
  - 2. Proprietary type for use in fire-rated assembly.
  - 3. Extruded-Polystyrene Board Insulation - Rigid, cellular, polystyrene thermal insulation formed from a polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as the blowing agent to comply with ASTM C 578 for Type IV, and with the following surface-burning characteristics:
    - a. Flame-spread and smoke-developed ratings of 75 and 450, respectively, according to ASTM E 84.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Ceiling Anchorage's - Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorage's to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.



- B. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches o.c.
- C. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of gypsum board assemblies. Engage fireproofing Installer to re-apply fireproofing materials to thickness' required to achieve fire-resistance ratings at no additional cost to the Owner. Protect adjacent fireproofing from damage.

### 3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard - Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at termination's in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
  - 1. Where building structure abuts ceiling perimeter or penetrates ceiling.
  - 2. Where partition framing and wall furring abut structure, except at floor.
    - a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.
    - b. Install deflection track top runner to attain lateral support and avoid axial loading.
    - c. Install deflection and fire-stop track top runner at fire-resistance-rated assemblies where indicated.
  - 1) Attach jamb studs at openings to tracks using manufacturer's standard stud clip.

- D. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

### 3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Screw furring members to wood framing.
- B. Suspend ceiling hangers from building structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
  4. Secure flat, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye-screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
  5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  6. Do not attach hangers to steel deck tabs.
  7. Do not attach hangers to steel roof deck or wood sub-floor. Attach hangers to structural members.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Sway-brace suspended steel framing with hangers used for support.
- D. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
1. Wire Hangers - 48 inches o.c.
  2. Carrying Channels (Main Runners) - 48 inches o.c.
  3. Furring Channels (Furring Members) - 16 inches o.c.
- E. Installation Tolerances - Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
- F. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
- G. Grid Suspension System - Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- H. For exterior soffits, install cross-bracing and additional framing to resist wind uplift according to details on Drawings.
- 3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS
- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.

- B. Installation Tolerances - Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
  - 1. Cut studs 1/2 inch short of full height to provide perimeter relief.
  - 2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Terminate partition framing at suspended ceilings where indicated.
- E. Install steel studs and furring in sizes and at spacings indicated.
  - 1. Single-Layer Construction - Space studs 16 inches o.c., unless otherwise indicated.
  - 2. Multi-layer Construction - Space studs 16 inches o.c., unless otherwise indicated.
  - 3. Cementitious Backer Unit Construction - Space studs 16 inches o.c., unless otherwise indicated.
- F. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- G. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
  - 1. Install 2 studs at each jamb, unless otherwise indicated.
  - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
  - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- H. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.
- I. Install thermal insulation as follows:
  - 1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
  - 2. Erect insulation vertically and hold in place with Z-furring members spaced 600 mm o.c.

3. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
4. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring channel with standard width insulation panel and continue in regular manner. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
5. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch diameter tie wire and inserted through slot in web of member.

### 3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards - Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Instead, float gypsum panels over these members using resilient channels or provide control joints to counteract wood shrinkage.
- I. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
- J. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

- K. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces such as above ceilings, except in chases that are braced internally.
  - 1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- L. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- M. Floating Construction - Where feasible, including where recommended by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.
- N. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- O. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
  - 1. Space screws a maximum of 12 inches o.c. for vertical applications unless indicated otherwise.
  - 2. Follow proprietary requirements for fire-rated assemblies.
- P. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

### 3.7 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
  - 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
  - 3. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of board.
  - b. At stairwells and other high walls, install panels horizontally.
4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- B. Wall Tile Substrates - For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:
  1. Install cementitious backer units to comply with ANSI A108.11 at locations indicated to receive wall tile.
  2. Install water-resistant gypsum backing board panels where indicated. Install with 1/4-inch open space where panels abut other construction or penetrations.
  3. Install gypsum wallboard panels with tapered edges taped and finished to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
- C. Multi-layer Application on Ceilings - Apply gypsum board indicated for base layers prior to applying base layers on walls/partitions; apply gypsum wallboard face layers in same sequence. Offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints. Apply base layers at right angles to framing members, unless otherwise indicated.
- D. Multi-layer Application on Partitions/Walls - Apply gypsum board indicated for base layers and gypsum wallboard face layers vertically (parallel to framing) with joints of base layers located over tube or furring member and face-layer joints offset at least one stud or furring member with base-layer joints. Stagger joints on opposite sides of partitions.
  1. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- E. Acoustical Tile Base - Where gypsum panels form the base for adhesively applied acoustical tile, install gypsum wallboard panels with tapered edges taped and finished to produce a flat surface.
- F. Single-Layer Fastening Methods - Apply gypsum panels to supports as follows:
  1. Fasten with screws.
- G. Multi-layer Fastening Methods - Apply base layers of gypsum panels and face layer to base layers as follows:
  1. Fasten both base layers and face layers separately to supports with screws.
  2. Fasten base layers with screws and face layer with adhesive and supplementary fasteners.



- H. Direct-Bonding to Substrate - Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's recommendations, and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- I. Exterior Soffits and Ceilings - Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered over supports.
  - 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
  - 2. Fasten with corrosion-resistant screws.
- J. For curved partitions, install gypsum panels as follows:
  - 1. Select gypsum panel lengths and cut them as required to produce one unbroken panel covering each curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
  - 2. Wet gypsum panels on surfaces that will become compressed when panels are installed over a curve and where curve radius prevents using dry panels. Comply with gypsum board manufacturer's recommendations relative to curve radii, wetting methods, stacking panels after wetting, and other preparations that precede installing wetted gypsum panels.
  - 3. Apply gypsum panels horizontally with wrapped edges perpendicular to studs. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum panels to studs as they are wrapped around the curve. On concave side, start fastening panels to stud at center of curve and work outward to panel ends. Fasten panels to framing with screws spaced 12 inches o.c.
  - 4. For double-layer construction, apply gypsum board base layer horizontally and fasten to studs with screws spaced 16 inches o.c. Center gypsum board face layers over joints in base layer and fasten to studs with screws spaced 12 inches o.c.
  - 5. Allow wetted gypsum panels to dry before applying joint treatment.

### 3.8 INSTALLING TRIM ACCESSORIES

- A. General - For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
  - 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
  - 2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
  - 3. Install U-bead where indicated.

- D. Install control joints at locations indicated and at intervals recommended by wallboard manufacturer for system used.
- E. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by COR for visual effect.

### 3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
- D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- E. Levels of Gypsum Board Finish - Provide the following levels of gypsum board finish per GA-214.
  - 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
  - 2. Level 2 where panels form substrates for tile and where indicated.
  - 3. Level 2 for gypsum board where indicated.
  - 4. Level 3 for gypsum board at concealed surfaces and where indicated.
  - 5. Level 4 for gypsum board surfaces, unless otherwise indicated.
- F. Use the following joint compound combination as applicable to the finish levels specified:
  - 1. Embedding and First Coat: Setting-type joint compound. Fill (Second) Coat: Setting-type joint compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
  - 2. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- G. For Level 4 gypsum board finish, and unless otherwise indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Provide skim coat at wainscot Type A to be feathered 12" above top cap and from ends of all paneling
- H. Where Level 3 gypsum board finish is indicated, embed tape in joint compound and apply first and fill (second) coats of joint compound.



- I. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
- J. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.
- K. Finish exterior gypsum soffit board using setting-type joint compounds to prefill joints and embed tape, and for first, fill (second), and finish (third) coats, with the last coat being a sandable product. Smooth each coat before joint compound hardens to minimize need for sanding. Sand between coats and after finish coat.
  - 1. Painting exterior gypsum soffit board after finish coat has dried is specified in another Division 9 Section.
- L. Base for Acoustical Tile - Where gypsum board is indicated as a base for adhesively applied acoustical tile, install joint tape and a 2-coat compound treatment, without sanding.
- M. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and gypsum board manufacturer's directions for treatment of joints behind tile.
- N. Finish glass-mat, water-resistant gypsum backing board to comply with gypsum board manufacturer's directions.
- O. Finish cementitious backer units to comply with unit manufacturer's directions.

### 3.10 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation - COR will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
  - 1. Notify COR one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.
  - 2. Prior to notifying COR, complete the following in areas to receive gypsum board ceilings:
    - a. Installation of 80 percent of lighting fixtures, powered for operation.
    - b. Installation, insulation, and leak and pressure testing of water piping systems.
    - c. Installation of air duct systems.
    - d. Installation of air devices.
    - e. Installation of mechanical system control air tubing.
    - f. Installation of ceiling support framing.

### 3.10 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.

- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09255

SECTION 09263 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Sections - The following Sections contain requirements that relate to this Section:
1. Section 09255 "Gypsum Board Assemblies" for requirements referenced in this Section for applying and finishing gypsum board over liner panels of gypsum board shaft-wall assemblies.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
1. A118.9 Test Methods and Specifications for Cementitious Backer Units.
- B. American Society for Testing and Materials (ASTM)
1. A 525 Standard Specification for General Requirements for Steel Sheet. Zinc-Coated (Galvanized) by the Hot-Dip Process.
  2. C 11 Terminology Relating to Gypsum and Related Building Materials and Systems.
  3. C 36 Specification for Gypsum Wallboard.
  4. C 442 Standard Specification for Gypsum Backing Board and Coreboard.
  5. C 475 Specification for joint Compound and Joint Tape for Finishing Gypsum Board.
  6. C 588 Specification for Gypsum Base for Veneer Plasters.
  7. C 630 Specification for Water-Resistant Gypsum Backing Board.
  8. C 645 Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks) and Rigid Furring Channels for Screw Application of Gypsum Board.
  9. C 665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  10. C 754 Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
  11. C 954 Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 mm) in Thickness.
  12. C 1002 Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
  13. E 90 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
  14. E 413 Classification for Rating Sound Insulation.
  15. E 488 Test Methods for Strength of Anchors in Concrete and Masonry Elements.

- 16. E 1190 Test Methods for Strength for Power-Actuated Fasteners Installed in Structural Members.

C. Gypsum Association

- 1. 505 Gypsum Board Terminology.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology - Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Performance Requirements, General - Provide gypsum board shaft-wall assemblies that comply with the following requirements:
  - 1. They are composed of proprietary gypsum board panels and metal components designed for erection from outside the shafts.
  - 2. They comply with performance requirements specified as determined from testing manufacturers' standard assemblies representing those indicated for this Project.
- B. Fire Resistivity - Fabricate and install gypsum board shaft-wall assemblies to have fire-resistance ratings indicated.
- C. Structural Performance Characteristics - Engineer, fabricate, and install gypsum board shaft-wall assemblies to withstand the following lateral design loads (air pressures) without failing and while maintaining an airtight and smoke-tight seal. Apply design loads transiently and cyclically under in-service conditions for maximum heights of partitions indicated. Evidence of failure includes deflections exceeding those indicated below, bending stresses causing studs to break or to distort, and end-reaction shear causing runners to bend or to shear and studs to become crippled.
  - 1. Lateral Design Load: As indicated, but not less than 10 psf.
  - 2. Deflection Limit: 1/240 of partition height, except where otherwise indicated.
- D. Sound-Attenuation Performance - For gypsum board shaft-wall assemblies indicated to have STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing agency.
  - 1. STC Rating: As indicated, but not less than 35.

1.5 SUBMITTALS

- A. Product data from manufacturers for each type of gypsum board shaft-wall assembly specified.

- B. Engineering data from gypsum board shaft-wall assembly manufacturer certifying and substantiating compliance of gypsum board shaft-wall assemblies with structural performance requirements.
- C. Assembly test reports from a qualified independent testing agency certifying and substantiating compliance of gypsum board shaft-wall assemblies with structural and sound-attenuation performance requirements based on tests performed on manufacturers' standard assemblies representing those indicated.
- D. Fire-test-response reports from testing and inspecting agency substantiating compliance of gypsum board shaft-wall assemblies with fire-resistivity performance requirements.
- E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence each assembly's compliance with requirements and with the building code in effect for Project.

#### 1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics - Provide gypsum board shaft-wall assemblies that comply with the following requirements:
  - 2. Fire-resistivity tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency includes UL, Warnock Hersey, or another agency performing testing and follow-up services that is acceptable to authorities having jurisdiction.
  - 3. Gypsum board wall assemblies indicated are identical in materials and construction to those tested for fire resistivity per ASTM E 119.
  - 4. Fire-resistance-rated assemblies are indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual," design designations listed in the UL "Fire Resistance Directory," or by Warnock Hersey or another qualified testing and inspecting agency.
- B. Single-Source Responsibility - Obtain components for gypsum board shaft-wall assemblies from a single manufacturer for each type of assembly indicated.
- C. Pre-installation Conference - Conduct conference at Project Site. Meet with Installer, qualified representative of gypsum board shaft-wall manufacturer, and installers of other construction that penetrates, attaches to, or otherwise affects shaft-wall construction.
  - 1. Review foreseeable methods and procedures related to shaft-wall construction including, but not necessarily limited to, the following:
    - a. Fasteners proposed for anchoring steel framing to building structure.
    - b. Structural framing protected by sprayed-on fireproofing.
    - c. Elevator equipment including hoistway doors, elevator call buttons, and elevator floor indicators.
    - d. Wiring devices in shaft-wall assemblies.
    - e. Doors and other items penetrating shaft-wall assemblies.
    - f. Items supported by shaft-wall-assembly framing.
    - g. Mechanical work enclosed within shaft-wall assemblies.

2. Record (Contractor) discussions of conference and furnish a copy to each attendee. If substantive disagreements exist at the conclusion of the conference, describe what they are, how they will be resolved, and set a date for reconvening the conference to finalize their resolution.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal trim and framing components.

#### 1.8 PROJECT CONDITIONS

- A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in the following Division 9 Section:
  1. Section 09255 "Gypsum Board Assemblies."

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Known Acceptable Source - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  1. United States Gypsum Co.

#### 2.2 BASIC ASSEMBLY MATERIALS

- A. General - Provide standard materials and components listed in manufacturer's published product literature for gypsum board shaft-wall assemblies of type and application indicated. Provide gypsum and other panels in maximum lengths available to eliminate or minimize end-to-end butt joints and in thickness' required to produce assemblies complying with structural and other performance requirements.
- B. Steel Framing - ASTM C 645, of profile, size, and base metal thickness required to produce assemblies complying with Part 1 "Assembly Performance Requirements" Article; with sectional properties computed to conform with AISI "Specification for the Design of Cold-Formed Steel Structural Members"; and as follows:
  1. Protective Coating: G 40 hot-dip galvanized coating per ASTM A 525.

- C. Gypsum Liner Panels - Proprietary liner panels as required for the specific fire-resistant-rated gypsum board shaft-wall assemblies indicated, with moisture-resistant paper facings.
- D. Gypsum Wallboard - ASTM C 36, type as required by fire-resistant assembly indicated, and as follows:
  - 1. Edges: Tapered and featured (rounded or beveled) for pre-filling.
- E. Gypsum Base for Veneer Plaster at Lobby Ceiling - ASTM C 588, type as required by fire-resistant assembly indicated, with square or tapered edges as standard with manufacturer.
- F. Gypsum Backing Board for Multi-layer Applications - ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, type as required by fire-resistant assembly indicated, edge configuration as standard with manufacturer.
- G. Water-Resistant Gypsum Backing Board - ASTM C 630, type as required by fire-resistant assembly indicated.
- H. Cementitious Backer Units - Complying with ANSI A118.9, in manufacturer's standard thickness but not less than 7/16 inch standard width.
- I. Accessories - Corner beads, edge trim, and control joints of material and shapes specified in the Division 9 Section referenced below that comply with gypsum board shaft-wall assembly manufacturer's recommendation for application indicated.
  - 1. Section 09255 "Gypsum Board Assemblies."
- J. Gypsum Wallboard Joint Treatment Materials - Provide materials complying with ASTM C 475 and recommendations of gypsum board shaft-wall assembly manufacturer for the applications indicated, and as specified in Section 09255, "Gypsum Board Assemblies."

## 2.3 MISCELLANEOUS MATERIALS

- A. General - Provide auxiliary materials for gypsum board shaft-wall construction that comply with requirements indicated and recommendations of gypsum board shaft-wall assembly manufacturer.
- B. Laminating Adhesive - Special adhesive or joint compound recommended for laminating gypsum boards of type indicated.
- C. Steel drill screws complying with ASTM C 1002 for fastening gypsum board to steel members less than 0.03 inch thick.
- D. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.
- E. Runner Fasteners - Power-driven fasteners of type indicated below and of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding

allowable design stress of runners, fasteners, or structural substrates where anchors are embedded.

1. Powder-Actuated Fasteners - Provide powder-actuated fasteners with the capability to sustain, without failure, a load equal to 10 times that imposed by shaft-wall assemblies, as determined from testing per ASTM E 1190 by a qualified testing agency.
  2. Post-installed Expansion Anchors - Where indicated, provide expansion anchors with the capability to sustain, without failure, a load equal to 5 times that imposed by shaft-wall assemblies, as determined from testing per ASTM E 488 by a qualified independent testing agency.
- F. Spot Grout - ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.
- G. Acoustical Sealant: - As recommended by gypsum board shaft-wall assembly manufacturer for application indicated.
- H. Sound-Attenuation Blankets - Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing):
1. Mineral Fiber Type - As standard with gypsum board shaft-wall assembly manufacturer and to comply with STC rating required.

## 2.4 BASIC ASSEMBLY DESCRIPTION

- A. General - Characteristics of selected components are described below for purposes of indicating proprietary gypsum board shaft-wall assemblies that are manufacturer's standard. Provide complete shaft-wall assemblies that comply with requirements indicated in this Article and Part 1 "Assembly Performance Requirements" Article.
- B. Fire Resistive Assembly - Provide; 2-hour rated assembly unless indicated otherwise.
- C. Cavity Shaft-Wall Assemblies - Provide assemblies constructed of proprietary gypsum liner panels inserted between steel tracks at each end of studs; with specially shaped steel studs engaged in tracks and fitted between gypsum liner panels; and with gypsum board on finished side or sides applied to studs in the number of layers, thickness' and arrangement indicated.
1. Gypsum Liner Panel Thickness - As standard with manufacturer for gypsum board shaft-wall assemblies indicated.
  2. Stud Shape - As standard with manufacturer for gypsum board shaft-wall assemblies indicated.
  3. Stud Thickness - 0.0329-inch minimum thickness of base metal.
  4. Stud Depth - As standard with manufacturer for gypsum board shaft-wall assemblies indicated.
  5. Room-Side Finish - 1 layer 5/8-inch-thick gypsum board unless otherwise indicated.
  6. Shaft-Side Finish - 1 layer of gypsum board of thickness indicated below; provide only where finish is indicated on shaft side as well as room side, otherwise leave exposed.



- a. Thickness - 5/8 inch.
- 7. Cavity Insulation - Provide sound-attenuation blankets in cavity formed by studs between shaft-wall liner panels and room-side finish.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut with Installer present. Substrates include hollow metal frames, elevator hoistway door frames, cast-in anchors, and structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of gypsum board shaft-wall assemblies. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, install continuous units formed from hot-dip galvanized sheet steel of thickness indicated. Fasten plates to building structure with fasteners spaced not more than 24 inches o.c. Secure ceiling runners to offset plates with screws spaced 24 inches o.c.
- B. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of shaft-wall assemblies. Protect from damage any fireproofing that remains.

#### 3.3 INSTALLATION OF GYPSUM BOARD SHAFT-WALL ASSEMBLIES

- A. General - Install gypsum board shaft-wall assemblies to comply with performance and other requirements indicated as well as with manufacturer's installation instructions and the following:
  - 1. ASTM C 754 for installing steel framing.
  - 2. Section 09255 "Gypsum Board Assemblies" for applying and finishing gypsum wallboard.
- B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support as indicated.
- C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
  - 1. Where handrails are indicated for direct attachment to gypsum board shaft-wall assemblies, provide not less than a 0.0341-inch-thick by 4-inch-wide galvanized steel reinforcement strip, accurately positioned and secured behind not less than 1 gypsum board face layer of 1/2-inch or 5/8-inch thickness.

- D. Coordinate gypsum board shaft-wall construction with sprayed-on fireproofing applied to structural elements so both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during the installation of shaft-wall assemblies to comply with requirements specified in Division 7 Section 07251, "Sprayed-On Fireproofing."
- E. Integrate stair hanger rods with gypsum board shaft-wall assemblies where indicated (and where possible) by locating cavity of assemblies where required to enclose rods.
- F. At penetrations in shaft wall, maintain fire-resistance rating of entire shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- G. Isolate shaft-wall assemblies from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details indicated on Drawings.
- H. Seal gypsum board shaft-walls at perimeter of each section that abuts other work and at joints and penetrations within each section. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; comply with manufacturer's instructions and ASTM C 919.

#### 3.4 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to Installer that ensures gypsum board shaft-wall assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09263

SECTION 09300 - TILE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Unglazed ceramic mosaic tile.
  - 2. Glazed ceramic mosaic tile.
  - 3. Stone thresholds.
- B. Related Sections: The following sections contain requirements that relate to this Section:
  - 1. Section 07920 "Joint Sealants" for Work pertaining to sealant Work.
  - 2. Section 09255 "Gypsum Board Assemblies" for Work pertaining to sealant Work.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
    - 1. A108.5 Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
    - 2. A108.10 Specifications for Installation of Grout in Tilework.
    - 3. A108.11 Specifications for Interior Installation of Cementitious Backer Units.
    - 4. A118.3 Specifications for Chemical Resistant Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive
    - 5. A118.4 Specifications for Latex-Portland Cement Mortar.
    - 6. A118.6 Specifications for Ceramic Tile Grouts.
    - 7. A118.9 Test Methods and Specifications for Cementitious Backer Units
    - 8. A137.1 Specifications for Ceramic Tile.
  - B. American Society for Testing and Materials (ASTM)
    - 1. C 241 90 Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
    - 2. C 499 78 Test Method for Facial Dimensions and Thickness of Flat, Rectangular Ceramic Wall and Floor Tile.
    - 3. C 503 89 Specification for Marble Dimension Stone.
    - 4. C 627 93 Method of Evaluating Ceramic Floor Tile Installation Systems.
    - 5. C 920 94 Specification for Elastomeric Joint Sealants.
    - 6. C 1028 89 Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
  - C. Tile Council of America (TCA)
    - 1 Handbook for Ceramic Tile Installation
- 1.3 SUBMITTALS
- A. Product data for each type of product specified.
  - B. Shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Locate precisely each joint and crack in tile substrates by measuring, record measurements on shop drawings, and coordinate them with tile joint locations, in consultation with COR.
- C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.
- D. Samples for verification purposes of each item listed below, prepared on samples of size and construction indicated, products involve color and texture variations, in sets showing full range of variations expected.
  1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on plywood or hardboard backing and grouted.
  2. Full-size units of each type of trim and accessory for each color required.
  3. Stone thresholds in 6-inch lengths.
  4. Metal edge strips in 6-inch lengths.
- E. Master grade certificates for each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- F. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile and tile setting and grouting products with requirements indicated.
- G. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of architects and owners, plus other information specified.

#### 1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Tile - Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Single-Source Responsibility for Setting and Grouting Materials - Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.
- C. Installer Qualifications - Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.
- D. Field-Constructed Mock-Up - Before installing tile, erect mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work.
  1. Locate mock-ups on site in location and size indicated or, if not indicated, directed by COR.
  2. Erect mock-ups in presence of COR.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain COR's acceptance of mock-ups before start of final unit of Work.

5. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work.
  - a. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If despite these precautions coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

#### 1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

#### 1.7 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
  1. Tile and Trim Units: Furnish quantity of full-size units equal to 1 percent of amount installed, for each type, composition, color, pattern, and size.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Known Acceptable Sources - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  1. Unglazed Ceramic Mosaic Tile - American Olean Tile Co., Inc.
  2. Glazed Ceramic Mosaic Tile - American Olean Tile Co., Inc.
  3. Mortars -
    - a. At tile over waterproof system: Similar to Laticrete Latapoxy 210.
    - b. Latex fortified, rapid setting, thin-set mortar, ANSI A118.4, white, with no mixing water, similar to Laticrete 4237 Rapid Latex with 211 Crete Powder.

4. Waterproof System - Extra-heavy floor service rating; 2-part latex, cold-applied liquid membrane, fabric reinforced non-woven polyester system, similar to Laticrete 9235.
5. Grout - 100 percent solids; epoxy grout; ANSI A 118.3; similar to Latapoxy SP 100 by Laticrete. Color as selected by COR.
6. Selections - As indicated in Interior Color Scheme Schedule.

## 2.2 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile - Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.
  1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials - Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures, and Patterns - Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
  1. Provide selections made by COR from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
  2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. Factory Blending - For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
- E. Mounting - Where factory-mounted tile is required, provide back or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.
  1. Where tile is indicated for installation in swimming pools, on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of uses and has been successfully used on other projects.
- F. Factory-Applied Temporary Protective Coating - Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.
- G. Color and Pattern - COR will provide pattern layout of multiple colors, straight-cut design for field and border t no additional cost to Owner. Selection of up to five (5) colors from manufacturer s standard selection and five (5) colors (20% of total material) from accent group selection to be allowed at no additional cost.

## 2.3 TILE PRODUCTS

- A. Unglazed Ceramic Mosaic Tile - Provide factory-mounted flat tile complying with the following requirements:
  1. Composition: Porcelain.

2. Nominal Facial Dimensions - 2 inches by 2 inches.
  3. Nominal Thickness - 1/4 inch.
  4. Face - Plain with cushion edges.
- B. Glazed Ceramic Mosaic Tile - Provide factory-mounted flat tile complying with the following requirements:
1. Composition - Porcelain.
  2. Nominal Facial Dimensions - 2 inches by 2 inches.
  3. Nominal Thickness - 1/4 inch.
  4. Face - Plain with cushion edges, polished.
- C. Trim Units - Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:
1. Size - As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
  2. Shapes - As follows, selected from manufacturer's standard shapes:
    - a. Base for Portland Cement Mortar Installations - Coved.
    - b. Base for Thin-set Mortar Installations - Coved.
    - c. Wainscot Cap for Portland Cement Mortar Installations - Bullnose cap.
    - d. Wainscot Cap for Thin-set Mortar Installations - Surface bullnose.
    - e. Wainscot Cap for Flush Conditions - Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
    - f. External Corners for Portland Cement Mortar Installations - Bullnose shape with a radius of at least 3/4 inch unless otherwise indicated.
    - g. External Corners for Thin-set Installations - Surface bullnose.
    - h. Internal Corners - Field-buttet square corners, except use coved base and cap angle pieces designed to member with stretcher shapes.
    - i. Tapered Transition Tile - Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide a reduction in thickness from 1/2 inch to 1/4 inch across nominal 4 inch dimension.

## 2.4 STONE THRESHOLDS

- A. General - Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.
- B. Marble Thresholds where indicated - Complying with ASTM C 503 requirements for exterior use and for abrasion resistance and a minimum hardness of 10 per ASTM C 241.
1. Submit to COR samples for color and finish.
  2. ADA approved shape, unless indicated otherwise.

## 2.5 CEMENTITIOUS BACKER UNITS (GLASS MESH MORTAR UNITS)

- A. Proprietary backing units with glass fiber mesh reinforcing and water-resistant coating on both faces, complying with the following requirements:
1. Cement-Coated Portland Cement Panels - High-density Portland cement surface coating on both faces and lightweight concrete core composed of Portland cement and expanded



ceramic aggregate; fabricated in panels 7/16-inch thick by 36 inches wide by 36, 48, 60, 64, or 72 inches long and weighing 3.2 to 3.8 psf.

- B. Mortar Unit Finishing Materials - Tape and joint compounds as recommended by manufacturer of cementitious backer units.
- C. Known Acceptable Sources - Subject to compliance with requirements, cementitious backer units which may be incorporated in the Work include, but are not limited to, the following:
  - 1. "Wonder-Board"; Modulars Inc.
  - 2. "Durock Tile Backer Board"; Durabond Div., USG Industries, Inc.

## 2.6 MISCELLANEOUS MATERIALS

- A. Metal Edge Strips (Parting Strip) - Zinc alloy or stainless steel terrazzo strips, brass finish, 1/4-inch wide at top edge with integral provision for anchorage to mortar bed or substrate unless otherwise indicated.
- B. Temporary Protective Coating - Provide either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout, is compatible with tile and mortar/grout products, and is easily removable after grouting is completed without damaging grout or tile.
  - 1. Petroleum paraffin wax, fully refined, tasteless, odorless, containing at least 0.5 percent oil with a melting point of 120 deg F (49 deg C) to 140 deg F (60 deg C) per ASTM D 87.
  - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

## 2.7 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

## 3.2 PREPARATION



- A. Blending - For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- B. Field-Applied Temporary Protective Coating - Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:

- 1. Petroleum paraffin wax or grout release.

### 3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard - Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.
- B. TCA Installation Guidelines - TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.
- E. Jointing Pattern - Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints - Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Prepare joints and apply sealants to comply with requirements of Section 07920, "Joint Sealants."
  - 3. Provide expansion joint at perimeter conditions and as required by Tile Council of America; provide in accordance with TCA Detail EJ 171.
- H. Grout tile to comply with the requirements of the following installation standards:
  - 1. For ceramic tile grouts (sand-Portland cement, dry-set, commercial Portland cement, and latex-Portland cement grouts), comply with ANSI A108.10.

- I. At showers, tubs and similar wet areas, install cementitious backer units and treat joints to comply with manufacturer's instructions for type of application indicated.

### **3.4 FLOOR INSTALLATION METHODS**

- A. Ceramic Mosaic Tile - Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of sub-floor construction, and grout types:
  1. Portland Cement Mortar - ANSI A108.1
    - a. Bond Coat - Latex-Portland cement mortar on cured bed, ANSI A108.5.
    - b. Grout - Latex-Portland cement.
  2. Latex-Portland Cement Mortar - ANSI A108.5.
- B. Stone Thresholds - Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.
  1. Set thresholds in latex-Portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
- C. Metal Edge Strips - Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

### **3.5 WALL TILE INSTALLATION METHODS**

- A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:
  1. Latex-Portland Cement Mortar - ANSI A108.5.

### **3.6 CLEANING AND PROTECTION**

- A. Cleaning - Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  1. Remove latex-Portland cement grout residue from tile as soon as possible.
  2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
  3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. Finished Tile Work - Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
  2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09300

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes ceilings composed of acoustical panels and exposed suspension systems and fire rated acoustic panels and exposed suspension systems.

1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
    - 1. A 446: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality (withdrawn).
    - 2. B 633: Specification for Electro-deposited Coatings of Zinc on Iron and Steel.
    - 3. C 635: Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
    - 4. C 636: Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
    - 5. E 84: Test Method for Surface Burning Characteristics of Building Materials.
    - 6. E 119: Test Methods for Fire Tests of Building Construction and Materials.
    - 7. E 488: Test Method for Strength of Anchors in Concrete and Masonry Elements.
    - 8. E 1190: Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
    - 9. E 1264: Classification for Acoustical Ceiling products.
    - 10. E 1414: Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
  - B. Ceiling and Interior Systems Construction Association (CISCA)
  - C. Underwriters Laboratories (UL)
  - D. American Society of Civil Engineers Structural Engineers Institute (ASCE 7-05)
- 1.3 SUBMITTALS
- A. Product data for each type of product specified.
  - B. Coordination drawings for reflected ceiling plans drawn accurately to scale and coordinating penetrations and ceiling-mounted items. Show the following:
    - 1. Ceiling suspension system members, including manufacturer layout of seismic joints as required by CISCA.
    - 2. Method of attaching suspension system hangers to building structure.
    - 3. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
    - 4. Minimum Drawing Scale: 1/4 inch = 1 foot.

- C. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
  - 1. 6-inch- square samples of each acoustical panel type, pattern, and color.
  - 2. Full-size samples of each acoustical panel type, pattern, and color.
  - 3. Set of 12-inch- long samples of exposed suspension system members, including moldings, for each color and system type required.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Product test reports from a qualified independent testing agency that are based on its testing of current products for compliance of acoustical panel ceilings and components with requirements.
- F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that show compliance of acoustical panel ceilings and components with the building code in effect for the Project.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications - Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics - Provide acoustical panel ceilings that comply with the following requirements:
  - 1. Fire-response tests are performed by a qualified testing and inspecting agency. Qualified testing and inspecting agencies include Underwriters Laboratories (UL), Warnock Hersey, or another agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
  - 2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
  - 3. Acoustical panel ceilings indicated are identical in materials and construction to those tested for fire resistance per ASTM E 119.
  - 4. Fire-resistance-rated, acoustical panel ceilings shall comply with UL Design Number D-216 as listed in the UL "Fire Resistance Directory."
  - 5. Products are identified with appropriate markings of applicable testing and inspecting agency.
- C. Single-Source Responsibility for Ceiling Units - Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- D. Single-Source Responsibility for Suspension System - Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

#### 1.6 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations - Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

#### 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. Acoustical Ceiling Units - Furnish quantity of full-size units equal to 2.0 percent of amount installed.
  - 2. Exposed Suspension System Components - Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Known Acceptable Source: Subject to compliance with requirements, acoustical panels that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Non-Fire-Resistance-Rated, 2'X4' Suspended ceiling, Armstrong Optima Vector (fine texture), Durabrite Surface, item #3908, Grid Face: 15/16" and 2'X2' (Corridor, Offices, Conference rooms and Lab) Suspended ceiling, Armstrong, Style: Ultima Vector (fine texture), Durabrite Surface, item #1920, Grid Face: 15/16".

#### 2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard - Provide manufacturer's standard panels which determine configuration indicated and that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance's, unless otherwise indicated.

1. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches [400 mm] away from the test surface) per ASTM E 795.
2. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.

## 2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard - Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
- B. Finishes and Colors - Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices - Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung using black steel hangers and framing only.
  1. Cast-In-Place and Post-installed Anchors in Concrete - Anchors of type and material indicated below, with holes or loops for attachment of hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E 488, conducted by a qualified testing agency.
    - a. Type - Cast-in-place anchors.
    - b. Type - Expansion anchors.
    - c. Corrosion Protection - Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
  2. Powder-Actuated Fasteners in Concrete - Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attachment of hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing agency.
- D. Hanger Rods - Mild steel, galvanized; 1/4 inch minimum diameter
- E. Flat Hangers - Mild steel, galvanized; minimum 1/8 inch by 1 inch.
- F. Angle Hangers - Angles with legs not less than 7/8 inch wide, formed with 0.0396-inch- thick galvanized-steel sheet complying with ASTM A 446, G 90 Coating Designation, with bolted connections and 5/16-inch- diameter bolts.
- G. Sheet-Metal Edge Moldings and Trim - Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
  1. For lay-in panels with reveal edge details, provide stepped-edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.



2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.
4. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel according to paint manufacturer's specifications for cleaning, conversion coating, and applying organic coating.

a. Color - Match color of finish on flanges of suspension system surfaces.

- H. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings - For interior ceilings composed of acoustical panels weighing less than 1 lb. per sq. ft., provide hold-down clips spaced 24 inches o.c. on all cross tees.
- J. Impact Clips - Where indicated, provide manufacturer's standard impact-clip system design to absorb impact forces against acoustical panels.

#### 2.4 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

- A. Wide-Face, Capped, Double-Web, Steel Suspension System - Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:
1. Structural Classification - Heavy-duty system.
  2. End Condition of Cross Runners - Override (stepped) or butt-edge type, as standard with manufacturer.
  3. Cap Material and Finish - Steel sheet painted white.
  4. Hanger wire shall not be used for suspension of ceiling systems.

#### 2.5 ACOUSTICAL SEALANT

- A. Acoustical Sealant - Refer to Section 07920 Joint Sealants for requirements.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Coordination - Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.



- B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

### 3.3 INSTALLATION

- A. General - Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
  - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
  - 2. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings".
  - 3. S.B.C., 1994 Edition: Acoustical Ceiling Systems
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
  - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
  - 4. Secure wire hangers at compression struts where required, minimum No. 8 gage hanger wire to ceiling suspension members and to supports above with a minimum of 4 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 6. Secure bracing wires to ceiling suspension members and to supports with a minimum of 4 tight turns. Fasten bracing wires to concrete with cast-in-place or post-installed anchors.
  - 7. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches (200 mm) from ends of each member.
  - 8. Provide No. 12 gage hanger wire within 3 inches of each corner of each light fixture in accordance with Seismic Zone 4 requirements. Tandem fixtures may utilize common wires. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not over 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m). Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
1. Arrange directionally patterned acoustical panels in the manner indicated on reflected ceiling plans.
  2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
  3. Install hold-down clips in areas indicated and in areas required by governing regulations, or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.
  4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

#### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09660 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Vinyl composition floor tile.
- B. Resilient wall base, reducer strips, and other accessories installed with resilient floor tiles are specified in Section 09678 "Resilient Wall Base and Accessories".

1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. E 648 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
  - 2. E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
  - 3. F 710 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
  - 4. F1066 Specification for Vinyl Composition Floor Tile.

1.3 SUBMITTALS

- A. Product data for each type of product specified.
  - 1. Certification by tile manufacturer that products supplied for tile installation comply with local regulations controlling use of volatile organic compounds (VOC's).
- B. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile indicated.
- C. Samples for verification purposes in full-size tiles of each different color and pattern of resilient floor tile specified, showing full range of variations expected in these characteristics.
- D. Product certificates, in lieu of laboratory test reports when permitted by COR, signed by manufacturer certifying that each product complies with requirements.
- E. Maintenance data for resilient floor tile, to include in Operating and Maintenance Manual specified in Division 1.

#### 1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Floor Tile - Obtain each type, color, and pattern of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Fire Performance Characteristics - Provide resilient floor tile with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Critical Radiant Flux - 0.45 watts per sq. cm or more per ASTM E 648.
  - 2. Smoke Density - Less than 450 per ASTM E 662.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver tiles and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.
- C. Store tiles on flat surfaces. Move tiles and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

#### 1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F.
- B. Do not install tiles until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during tile installation.

#### 1.7 SEQUENCING AND SCHEDULING

- A. Install tiles and accessories after other finishing operations, including painting, have been completed.

- B. Do not install tiles over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

## 1.8 EXTRA MATERIALS

- A. Deliver extra materials to Government. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
  - 1. Furnish not less than one box for each 50 boxes or fraction thereof, of each class, wearing surface, color, pattern and size of resilient floor tile installed.

## PART 2 - PRODUCTS

### 2.1 RESILIENT TILE

- A. Vinyl Composition Floor Tile - Products complying with ASTM F 1066, Composition 1 (non-asbestos formulated), and with requirements specified in Vinyl Composition floor Tile Product Data Sheet at end of this Section.

### 2.2 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer - Non-staining type as recommended by flooring manufacturer.
- B. Trowelable Under-layments and Patching Compounds - Latex-modified, Portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- C. Adhesives (Cements) - Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.
- D. Metal Edge Strips - Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. General - Examine areas where installation of tiles will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer's requirements and those specified in this Section.
- B. Concrete Sub-floors - Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
  2. Finishes of sub-floors for slabs receiving resilient flooring.
  3. Sub-floors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General - Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.
- B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

### 3.3 INSTALLATION

- A. General - Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.
- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles with grain running in one direction.
  2. Lay tiles in basket weave pattern with grain direction alternating between reversed in adjacent tiles.

3. Lay tiles in pattern with respect to location of colors, patterns, and sizes as indicated on Drawings.
- D. Where demountable partitions and other items are indicated for installing on top of finished tile floor, install tile before these items are installed.
- E. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- F. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- G. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on sub-floor. Use chalk or other non-permanent marking device.
- H. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- I. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.
- J. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- K. Hand roll tiles where required by tile manufacturer.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing tile installation:
  1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
  2. Sweep or vacuum floor thoroughly.
  3. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
  4. Damp-mop tile to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

1. Apply protective floor polish to tile surfaces that are free from soil, visible adhesive, and surface blemishes.
    - a. Use commercially available, metal, cross-linked acrylic product acceptable to tile manufacturer.
    - b. Coordinate selection of floor polish with Government's maintenance service.
  2. Cover tiles with undyed, untreated building paper until inspection for Substantial Completion.
  3. Do not move heavy and sharp objects directly over tiles. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean tiles using method recommended by manufacturer.
1. Strip protective floor polish that was applied after completing installation prior to cleaning.
  2. Reapply floor polish after cleaning.

### 3.5 PRODUCT DATA SHEET - VINYL COMPOSITION FLOOR TILE

- A. Vinyl Composition Floor Tile Designation: VCT
- B. Class 1 (solid color tile)
- C. Wearing Surface: Smooth
- D. Thickness: 1/8 inch
- E. Size: 12 by 12 inches
- F. Color and Pattern: As approved by the COR.

END OF SECTION 09660



SECTION 09678 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Resilient wall base.
  - 2. Resilient carpet accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 09660 "Resilient Tile Flooring."
  - 2. Section 09680 "Carpet."

1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. E 648 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Energy Source.
  - 2. E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- B. Underwriters Laboratories Inc. (UL)

1.3 SUBMITTALS

- A. Product data for each type of product specified.
- B. Samples for initial selection purposes of manufacturer's standard sample sets in form of pieces cut from each type of product specified showing full range of colors and patterns available.
- C. Samples for verification purposes in manufacturer's standard sizes, but not less than 12 inches long, of each different color and pattern of product specified.
- D. Product certificates, in lieu of laboratory test reports when permitted by COR, signed by manufacturer certifying that each product complies with requirements.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Products - Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

- B. Fire Performance Characteristics - Provide products with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

- 1. Critical Radiant Flux - 0.45 watts per sq. cm or more per ASTM E 648.
  - 2. Smoke Density - Less than 450 per ASTM E 662.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.
- C. Move products into spaces where they will be installed at least 48 hours in advance of installation.

#### 1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F in spaces to receive products specified in this Section for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F.
- B. Do not install products until they are at the same temperature as that of the space where they are to be installed.
- C. Close spaces to traffic during installation of products specified in this Section.

#### 1.7 SEQUENCING AND SCHEDULING

- A. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.

#### 1.8 EXTRA MATERIALS

- A. Deliver extra materials to Government. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels clearly describing contents.
  - 1. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof of each different type and color of resilient wall base installed.

### PART 2 - PRODUCTS

#### 2.1 RESILIENT WALL BASE

- A. Vinyl Wall Base - Products complying with FS SS-W-40, Type II, and requirements specified in the Vinyl Wall Base Product Data Sheet at end of this Section.

## **2.2 RESILIENT ACCESSORIES**

- A. Vinyl Accessories - Products complying with requirements specified in Vinyl Accessory Product Data Sheet at end of this Section.

## **2.3 INSTALLATION ACCESSORIES**

- A. Concrete Slab Primer - Non-staining type as recommended by flooring manufacturer.
- B. Trowelable Under-layments and Patching Compounds - Latex-modified, Portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- C. Adhesives - Water-resistant type recommended by manufacturer to suit resilient flooring product and substrate conditions indicated.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

- A. Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section.

## **3.2 PREPARATION**

- A. General - Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.
- B. Use trowelable leveling and patching compounds per manufacturers directions to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered immediately before installing products specified in this Section. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

## **3.3 INSTALLATION**

- A. General - Install products specified in this Section using methods indicated according to manufacturer's installation directions.

- B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
  - 1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
  - 2. Install inside and exterior corners before installing straight pieces.
  - 3. Form inside corners on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.
  - 4. Form outside corners on job from straight pieces of maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base and only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of wall base.
- C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.
- D. Apply resilient accessories to stairs as indicated and according to manufacturer's installation instructions.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
  - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.
  - 2. Sweep or vacuum floor thoroughly.
  - 3. Do not wash floor until after time period recommended by manufacturer.
  - 4. Damp-mop resilient accessories to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of resilient product involved.
  - 1. Apply protective floor polish to resilient accessories that are free from soil, visible adhesive, and surface blemishes.
    - a. Use commercially available metal, cross-linked, acrylic product acceptable to resilient accessory manufacturer.
    - b. Coordinate selection of floor polish with Government's maintenance service.
  - 2. Cover resilient accessories on floors and stairs with undyed, untreated building paper until inspection for Substantial Completion.

- C. Clean products specified in this Section not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer.
  - 1. Strip protective floor polish that was applied after completing installation, prior to cleaning.
  - 2. Reapply floor polish after cleaning.

3.5 PRODUCT DATA SHEET 2 - VINYL WALL BASE

- A. Vinyl Wall Base Designation: WB
- B. Style: Cove with top-set toe at areas indicated in Room Finish Schedule.
- C. Minimum Thickness - 1/8 inch
- D. Height - 4 inches
- E. Lengths - Coils in lengths standard with manufacturer but not less than 96 feet
- F. Exterior Corners - Premolded.
- G. Interior Corners - Premolded.
- H. Surface Characteristics - Smooth.
- I. Color and Pattern - As approved by the COR.

3.6 PRODUCT DATA SHEET 6 - VINYL ACCESSORY

- A. Vinyl Accessory Designation - Vinyl Edge Strips
- B. Product Description - Carpet edge for glue down applications, Nosing for resilient floor covering, and reducer strip for resilient flooring.
- C. Profile and Dimensions - As indicated.
- D. Color - As approved by the COR. Match vinyl wall base.

END OF SECTION 09678

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes carpet, carpet cushion, and installation.
- B. Related Sections - The following Sections contain requirements that relate to this Section:
  - 1. Section 09678 "Resilient Wall Base and Accessories" for materials and installation.
  - 2. Section 16515 "Interior Lighting" for floor reflectance factors required in designing and selecting lighting fixtures.

1.2 REFERENCE STANDARDS

- A. American Association of Textile Chemists and Colorists (AATCC)
  - 1. 134 Electrostatic Propensity of Carpets.
  - 2. 138 Shampooing, Washing of Textile Floor Coverings.
- B. American Society for Testing and Materials (ASTM)
  - 1. E 84 Test Method for Surface Burning Characteristics of Burning Materials.
- C. Carpet and Rug Institute (CRI)
  - 1. 104 Standard for Installation of Commercial Textile Floor-covering Materials.
- D. Federal Standard, Department of Commerce (FSDC)
  - 1. CPSC 16 CFR Part 1630 Standard for the Surface Flammability of Carpets and Rugs.
- D. National Fire Protection Association (NFPA)
  - 1. 99 Standard for Health Care Facilities.

1.3 SUBMITTALS

- A. Product Data for each type of carpet material, carpet cushion, and installation accessory specified. Submit manufacturer's printed data on physical characteristics, durability, fade resistance, and fire-test-response characteristics. Submit methods of installation for each type of substrate.

- B. Shop Drawings showing columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet. Indicate the following:
  - 1. Carpet type, color, and dye lot.
  - 2. Locations where dye lot changes occur.
  - 3. Seam locations, types, and methods.
  - 4. Type of sub-floor.
  - 5. Type of installation.
  - 6. Pattern type, repeat size, location, direction, and starting point.
  - 7. Pile direction.
  - 8. Type, color, and location of insets and borders.
  - 9. Type of cushion.
  - 10. Type, color, and location of edge, transition, and other accessory strips.
  - 11. Transition details to other flooring materials.
- D. Samples for initial selection in the form of manufacturer's color charts or Samples of materials showing the full range of colors, textures, and patterns available for each type of carpet indicated.
- E. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work. Label each sample with manufacturer's name, material type, color, pattern, and designation indicated on Drawings and carpet schedule. Submit the following:
  - 1. 12-inch- square Samples of each type of carpet material required.
  - 2. 12-inch Samples of each type of exposed edge stripping and accessory item.
- F. Schedule of carpet using same room designations indicated on Drawings.
- G. Maintenance data for carpet and cushion to include in operation and maintenance manuals. Include the following:
  - 1. Methods for maintaining carpet and carpet cushion, including manufacturer's recommended frequency for maintaining carpet.
  - 2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance. Include cleaning and stain-removal products and procedures.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications - Engage an experienced Installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with FCIB certification program requirements.
- B. Manufacturer Qualifications - Engage a firm whose carpet materials comply with the U.S. Department of Housing and Urban Development's (HUD) "Use of Materials Bulletin UM-44D"

and are currently listed on HUD's "Certified Products Directory" and so identified by imprint on back of carpet.

- C. Single-Source Responsibility - Obtain each type of carpet from one source and by a single manufacturer.
- D. Carpet Fire-Test-Response Characteristics - Provide carpet with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface Flammability - Passes CPSC 16 CFR, Part 1630.
  - 2. Flame Spread - 25 or less per ASTM E 84.
  - 3. Smoke Developed - 450 or less per ASTM E 84.
- E. Mockups - Prior to installing carpet, construct mockups for each type of carpet and installation method required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
  - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by COR.
  - 2. Notify COR one week in advance of the dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain COR's approval of mockups before start of final unit of Work.
  - 5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    - a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. General - Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling."
- B. Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.
- C. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, with continuous blocking off ground.

#### 1.6 PROJECT CONDITIONS



- A. General - Comply with CRI 104, Section 6: "Site Conditions."
- B. Space Enclosure and Environmental Limitations - Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.
- C. Sub-floor Moisture Conditions - Moisture emission rate of not more than 3 lb./1000 sq. ft./24 hours when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with sub-floor temperatures not less than 55 deg F.
- D. Sub-floor Alkalinity Conditions - A pH range of 5 to 9 when sub-floor is wetted with potable water and pHDrion paper is applied.

#### 1.7 WARRANTY

- A. General Warranty - The special warranty specified in this Article shall not deprive the Government of other rights the Government may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Carpet Warranty - Submit a written warranty executed by carpet manufacturer and Installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
- C. Warranty Period - 5 years from date of Final Acceptance by the Government.

#### 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. Carpet - Before installation begins, furnish quantity of full-width units equal to 5 percent of amount installed.

### PART 2 - PRODUCTS

#### 2.1 CARPET

- A. Known Acceptable Source - As approved by the COR.

#### 2.2 INSTALLATION ACCESSORIES

- A. Concrete-Slab Primer - Non-staining type as recommended by the following:

1. Carpet manufacturer.
- B. Trowelable Under-layments and Patching Compounds - As recommended by the following:
  1. Carpet manufacturer.
- C. Adhesives - Water-resistant, mildew-resistant, non-staining type to suit products and sub-floor conditions indicated and to comply with flammability requirements for installed carpet as recommended by the following:
  1. Carpet manufacturer.
- D. Tackless Carpet Stripping - Water-resistant plywood in strips as required to match cushion thickness and in compliance with CRI 104, 11.3.
- E. Seaming Cement - Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- F. Static Generation - Less than 2.0 KV at 20 percent relative humidity in accordance with AATCC-134 using step and scuff tests with neo-lite and chrome tanned leather soles. Administer AATCC-138 cleaning procedure for carpet prior to static generation tests.
- G. Electrical Resistance - Tested in accordance with NFPA 99; not less than  $2.5 \times 10$  (to the fourth power) others not more than  $1 \times 10$  (to eighth power), others measured across the surface of the floor covering through panel to under-structure.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine sub-floors and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting performance of carpet. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Verify that sub-floors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the following:
  1. Carpet manufacturer.

#### 3.2 PREPARATION

- A. General - Comply with carpet manufacturer's installation recommendations to prepare substrates indicated to receive carpet installation.
- B. Level sub-floor within 1/4 inch in 10 feet, non-cumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
  - 1. Use leveling and patching compounds to fill cracks, holes, and depressions in sub-floor as recommended by the following:
    - a. Carpet manufacturer.
- C. Remove sub-floor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.
- D. Broom or vacuum clean sub-floors to be covered with carpet. Following cleaning, examine sub-floors for moisture, alkaline salts, carbonation, or dust.
- E. Concrete-Sub-floor Preparation - Apply concrete-slab primer, according to manufacturer's directions, where recommended by the following:
  - 1. Carpet manufacturer.

### 3.3 INSTALLATION

- A. Direct Glue-Down Installation - Comply with CRI 104, Section 8: "Direct Glue-Down."
- B. Stretch-in Installation - Comply with CRI 104, Section 11: "Stretch-in Utilizing Tackless Strip."
- C. Comply with carpet manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Do not bridge building expansion joints with continuous carpet.
- D. Where demountable partitions or other items are indicated for installation on top of finished carpet floor, install carpet before installation of these items.
- E. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING

- A. Perform the following operations immediately after completing installation.
  - 1. Remove visible adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
  - 2. Remove protruding yarns from carpet surface.
  - 3. Vacuum carpet using commercial machine with face-beater element.

3.5 PROTECTION

- A. General - Comply with CRI 104, Section 15: "Protection of Indoor Installation."
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure carpet is without damage or deterioration at the time of Final Acceptance by the Government.

END OF SECTION 09680

SECTION 09800 - SPECIAL COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes applying special coating systems to items and surfaces scheduled, including surface preparation, prime coats, and topcoats.
- B. Types of special coating systems required for the Project include the following:
  - 1. Special coatings for exterior use include the following:
    - a. At existing metal siding surfaces provide Duranar A.D fluorocarbon coating over PPG polyclutch wash primer.
- C. Related Sections - The following Sections contain requirements that relate to this Section:
  - 1. General painting is specified in Section 09900 "Painting".

1.2 REFERENCE STANDARDS

- A. Steel Structures Painting Council (SSPC)
  - 1. SP 10 Surface Preparation Specification No. 10 - Near -White Blast Cleaning.

1.3 SUBMITTALS

- A. Product data for each coating system specified.
  - 1. Provide the manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material proposed for use.
  - 2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
  - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs). VOCs shall not exceed 2.8 lbs. per gallon.
- B. Samples for initial color selections in the form of manufacturer's color charts.
  - 1. After color selections, the COR will identify color chips for surfaces to be coated.
- C. Samples for Verification Purposes: Provide samples of each color and material to be applied with texture to simulate actual conditions on representative samples of the actual substrate.
  - 1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until the required sheen, color, and texture are achieved.

2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
3. Submit samples on the following substrates for the COR's review of color and texture only.
  - a. Ferrous Metal: Provide two 4-inch (100-mm) square samples of flat metal and two 8-inch (200-mm) long samples of solid metal for each color and finish.

#### 1.4 QUALITY ASSURANCE

- A. Applicator Qualifications - Engage an experienced applicator who has successfully completed coating system applications similar in material and extent to those indicated for the Project.
- B. Single-Source Responsibility - Provide primers and undercoat material produced by the same manufacturer as the finish coats for each type of coating. Use only thinners recommended by the manufacturer and only within recommended limits.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials during transport, delivery, and storage from damage, including impact, breakage, contamination of contents, and temperature and weather related damage such as freezing.
- B. Deliver materials to the job site in the manufacturer's original, new, unopened packages, and containers bearing manufacturer's name and label, and the following information:
  1. Name or title of material.
  2. Product description (generic classification or binder type).
  3. Manufacturer's name, stock number and date of manufacture.
  4. Contents by volume, for major pigment and vehicle constituents.
  5. Thinning instructions.
  6. Application instructions.
  7. Color name and number.
  8. Handling instructions and precautions.
- C. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 50 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  1. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying the coatings.
  2. Store materials for each coating system together to prevent accidental mixing of components of different coating systems.

#### 1.6 PROJECT CONDITIONS

- A. Apply coatings only when the temperature of materials, of surfaces to be coated, and of surrounding air temperatures are between 50 deg F and 90 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when the relative humidity exceeds 85 percent; at temperatures less than 5 F deg (3 C deg) above the dew point; or to damp or wet surfaces.

1. Allow wet surfaces to dry thoroughly and attain the temperature and conditions specified before proceeding with or continuing the coating operation.
2. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and the temperature within the area can be maintained within specified limits during application, drying, and curing periods.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis for Design at Exterior Ferrous Metal Surfaces - The following special coating system establishes the basis for design:
  1. Known Acceptable Source, Field Applied Primer - 1 coat PPG Polyclutch Wash Primer 97-687 at 0.3 to 0.5 mils minimum dry film thickness.
  2. Known Acceptable Source, Top/Color Coat - 1 coat of Duranar A.D. air-drying fluorocarbon coating at 1.0 to 1.1 mils minimum dry film thickness. Custom colors shall be as selected by the COR.

### 2.2 SPECIAL COATING MATERIALS, GENERAL

- A. Material Compatibility - Provide primers, finish coat material, and related materials that are compatible with one another and the substrates indicated under conditions of service and application as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality - Provide the highest grade of the various coatings as regularly manufactured by acceptable coating manufacturers. Materials not displaying manufacturer's identification as a best-grade product will not be acceptable.
  1. Proprietary Names - Use of manufacturer's proprietary product names to designate colors or materials are not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions under which coatings will be applied for compliance with requirements on applying coatings. Surfaces to receive coatings must be thoroughly dry before coatings are applied.
  1. Do not proceed with coating application until unsatisfactory conditions have been corrected.
  2. Start of application will be construed as the Applicator's acceptance of surfaces within that particular area.
- B. Coordinating Work - Review sections in which other coatings are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on the characteristics of specified finish materials to ensure compatible primers.

### 3.2 PREPARATION

## SPECIAL COATINGS

- A. General - Prior to surface preparation, fully enclose the work area to contain dust and paint overspray. Monitor paint removal to verify that lead levels are below action levels. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already in place that are not to be coated, or provide surface-applied protection prior to surface preparation and coating. Remove these items, if necessary, to completely coat the items and adjacent surfaces. Following the coating operations in each space or area, have removed items reinstalled by workers skilled in the trades involved.
- B. Cleaning - Before applying coatings or other surface treatments, clean the substrates of substances that could impair bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and coating application so dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.
- C. Surface Preparation - Clean and prepare surfaces to be coated according to the manufacturer's instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers, or remove and reprime. Notify the COR in writing of problems anticipated when using the specified finish-coat material with substrates primed by others.
  - 2. Ferrous Metal: Clean ungalvanized ferrous metal surfaces; remove oil, grease, dirt, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the recommendations of the coating manufacturer.
    - a. Blast-clean exterior surfaces as recommended by the coating system manufacturer and according to the requirements of SSPC Specification SSPC-SP 10.
- D. Material Preparation - Carefully mix and prepare materials according to the coating manufacturer's directions.
  - 1. Maintain containers used in mixing and application of coatings according to the manufacturer's directions.
  - 2. Stir materials before applying to produce a mixture of uniform density; stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain the coating material before using.
  - 3. Use only the type of thinners approved by the manufacturer and only within recommended limits.
- E. Tinting - Tint each undercoat a lighter shade to facilitate identifying each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

### 3.3 APPLICATION

- A. General - Apply special coatings by brush, or spray, applicators according to the manufacturer's directions. Use brushes best suited for the material being applied.
  - 1. Do not apply coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
  - 2. Coating colors, surface treatments, and finishes are indicated in the Schedules.
  - 3. Provide finish coats compatible with the primers used.
  - 4. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as



- recommended by the manufacturer. Where sanding is required, according to the manufacturer's directions, sand between applications to produce a smooth, even surface.
5. When undercoats or other conditions show through the final coat, apply additional coats until the cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
  6. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
    - a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces.
    - b. Coat the back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
    - c. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
- B. Scheduling Coating - Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient drying time between successive coats. Do not recoat until the coating has dried so it feels firm and does not deform or feel sticky under moderate thumb pressure and where applying another coat does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures - Apply coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
  2. Spray Equipment - Use spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness - Apply each material no thinner than the manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by the manufacturer.
- E. Prime Coats - Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to the material required to be coated or finished that has not been prime-coated by others.
1. Recoat primed and sealed substrates where there is evidence of suction spots or unsealed areas in the first coat to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- F. Brush Application - Brush-out and work brush coats into surfaces in an even film. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
1. Apply primers and first coats by brush unless the manufacturer's instructions permit using mechanical applicators.

- G. Mechanical Applications - Use mechanical methods to apply coating when permitted by the manufacturer's recommendations and governing regulations.
  - 1. Wherever using spray application, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double-back with spray equipment building-up film thickness of two coats in one pass, unless recommended by the manufacturer.
- H. Completed Work - Match approved samples for color, texture and coverage. Remove, refinish, or recoat work not complying with specified requirements.

### 3.4 CLEANING

- A. Cleanup - At the end of each work day, remove rubbish, empty cans, rags, and other discarded materials from the site.
  - 1. After completing work, clean glass and spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

### 3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as acceptable to the COR. Leave in an undamaged condition.
  - 1. Provide "Wet Paint" signs to protect newly coated finishes. Remove temporary protective wrappings provided by others to protect their work after completing coating operations.
  - 2. At completion of other trades' construction activities, touch up and restore damaged or defaced coated surfaces.

END OF SECTION 09800

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes typical painting of interior surfaces.

1.2 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
1. Material List - Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  2. Manufacturer's Information - Provide manufacturer's technical information, including label analysis and instructions for handling, storing, weight per gallon, viscosity, fineness of grain, drying time, gloss, and applying each coating material proposed for use.
  3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification - Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
  2. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
  3. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
  4. Submit samples on the following substrates for the COR's review of color and texture only:
    - a. Concrete Masonry Units - Provide four 4-inch square samples for each color and finish.
    - b. Painted Wood - Provide four 12-inch square samples of each color and material on hardboard.
- C. List: Submit paint and coating materials list giving the manufacturer's name, product name and product number for each material.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications - Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project .

- B. Single-Source Responsibility - Provide primers and undercoat material produced by the same manufacturer as the finish coats for each type of coating. Use only thinners recommended by the manufacturer and only within recommended limits.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Contents by volume, for pigment and vehicle constituents.
  - 5. Thinning instructions.
  - 6. Application instructions.
  - 7. Color name and number.
  - 8. VOC content.
  - 9. Handling instructions and precautions.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.5 PROJECT CONDITIONS

- A. Apply coatings only when the temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
  - 1. Allow wet surfaces to dry thoroughly and attain the temperature and conditions specified before proceeding with or continuing coating operation.
  - 2. Work may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- C. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces, or as approved by COR.
  - 1. Painting includes field-painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

2. Colors - All colors shall be mixed in accordance with the manufacturers instructions. The number of coats required to ensure adequate and complete coverage in the opinion of the COR shall not necessarily be limited to the number of coats specified in the Painting Schedule contained in this Section. More than one color may be used on any wall surface with straight line separation between colors at no additional cost to the Government. The COR reserves the right to select at no additional cost, bright or accent colors in quantity amounting to 20 percent of the total interior wall surface area to be painted.
  3. Colors of priming coats (and body coats where specified) shall be lighter than those of finish coat.
- D. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
1. Prefinished items not to be painted shall include, but are not limited to, the following factory-finished components:
    - a. Metal toilet enclosures.
    - b. Acoustic materials.
    - c. Architectural woodwork and casework.
    - d. Tile, terrazzo, stone, and brick.
    - e. Elevator equipment.
    - f. Finished mechanical and electrical equipment.
    - g. Light fixtures.
    - h. Switch-gear.
    - i. Distribution cabinets.
  2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
    - a. Foundation spaces.
    - b. Furred areas.
    - c. Utility tunnels.
    - d. Pipe spaces.
    - e. Duct shafts.
    - f. Elevator shafts.
  3. Finished metal surfaces not to be painted include:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper.
    - e. Bronze.
    - f. Brass.
  4. Operating parts not to be painted include moving parts of operating equipment, such as the following:

- a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
5. Labels - Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

#### 1.6 QUALITY ASSURANCE

- A. Applicator Qualifications - Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. Single-Source Responsibility - Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- C. Field Samples - On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
  1. Final acceptance of colors will be from job-applied samples.
  2. The COR will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface according to the schedule or as specified.
    - a. After finishes are accepted, this room or surface will be used to evaluate coating systems of a similar nature.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
  1. Product name or title of material.
  2. Product description (generic classification or binder type).
  3. Manufacturer's stock number and date of manufacture.
  4. Contents by volume, for pigment and vehicle constituents.
  5. Thinning instructions.
  6. Application instructions.
  7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.8 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F and 90 deg F.
- B. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 F deg above the dew point; or to damp or wet surfaces.
  1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  1. Devoe and Raynolds Co. (Devoe).
  2. Fuller O'Brien (Fuller).
  3. The Glidden Company (Glidden).
  4. Benjamin Moore and Co. (Moore).
  5. PPG Industries, Pittsburgh Paints (PPG).
  6. Pratt and Lambert (P & L).
  7. The Sherwin-Williams Company (S-W).

#### 2.2 INTERIOR PAINT MATERIALS, GENERAL

- A. Material Compatibility - Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality - Provide the manufacturer's paint material equal to or better than Benjamin Moore best quality of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable. All paint material shall be low or no VOC as per guidance from the USGBC (United States Green Building Council).
  1. Proprietary Names - Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions. Include percentage of pigment content and other materials.

- C. Colors - Provide color selections as approved by the COR.

## 2.3 PRIMERS

- A. Primers - Provide the manufacturer's recommended factory-formulated primers that are compatible with the substrate and finish coats indicated.
  - 1. Concrete and Masonry Repairs - Suitable for epoxy paint finish coat.
  - 2. New Plaster Primers - Interior flat latex-based paint.
  - 3. Gypsum Drywall Primer - White interior latex-based primer.

## 2.4 UNDERCOAT MATERIALS

- A. Undercoat Materials - Provide the manufacturer's recommended factory-formulated undercoat materials that are compatible with the substrate and finish coats indicated.
  - 1. Interior Enamel Undercoat - Ready-mixed thermoplastic acrylic emulsion primer fortified with rust inhibiting pigments enamel.

## 2.5 INTERIOR FINISH PAINT MATERIAL

- A. Finish Paint - Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.
  - 1. Gypsum Wallboard and Existing Plaster - Interior, Latex-Based Paint, Ready-mixed, latex-based paint.
    - a. Semi-gloss finish at plaster
    - b. Manufacturers suggested scrubbable finishes submitted to COR for selection at gypsum board at walls and ceilings.

## 2.6 MISCELLANEOUS WOOD-FINISHING MATERIALS

- A. Wood-Finishing Materials - Subject to compliance with requirements, wood-finishing materials that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Cut Shellac - Quick-drying, rosin-free, clear, general-purpose shellac varnish.
  - 2. Paste Wood Filler - Solvent-based, air-drying, paste-type wood filler.
  - 3. Oil Rubbing Varnish - Clear, polyurethane, rubbing varnish for use on interior stained or natural-finished woodwork.
  - 4. Stain - Oil-type interior wood stain, sanding sealer and varnish suitable for application on existing finish.
- B. Paste Wax - Provide paste wax as recommended by the coating manufacturer for use on interior stained and natural-finished woodwork.

## PART 3 - EXECUTION



### 3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
  - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
  - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work - Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify the COR about anticipated problems using the materials specified over substrates primed by others.

### 3.2 PREPARATION

- A. General - Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning - Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation - Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers and previously coated surfaces or remove and reprime. Notify COR in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
  - 2. Cementitious Materials - Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive-blast cleaning methods if recommended by the paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

- c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
  - 3. Wood - Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
    - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    - b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    - c. When transparent finish is required, back-prime with spar varnish.
    - d. Back-prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
    - f. Previously Coated Opaque Finish: Remove loose coats of finish using blade scraper and wire brush. Sand remaining finish to feather imperfections using consecutive 100-grit and 200 grit sandpaper. Lightly sand entire surface with 200-grit sandpaper. Seal and prime pursuant to this document.
  - 4. Ferrous Metals - Clean non-galvanized, ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
    - a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
  - 5. Galvanized Surfaces - Clean galvanized surfaces with non-petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation - Carefully mix and prepare paint materials according to manufacturer's directions.
- 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  - 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer and only within recommended limits.

- E. Tinting - Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.3 APPLICATION

- A. General - Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are to be provided by the COR.
2. Provide primer coats that are compatible with finish coats used.
3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. and between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Finish exterior doors on interior face and tops, bottoms, and side edges the same as exterior faces.
11. Sand lightly between each succeeding enamel or varnish coat.
12. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

- C. Scheduling Painting - Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm and does not deform or feel sticky under

moderate thumb pressure, and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

- D. Application Procedures - Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
  - 1. Brushes - Use brushes best suited for the material applied.
  - 2. Rollers - Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
  - 3. Spray Equipment - Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness - Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer for color scheduled.
- F. Mechanical and Electrical Work - Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
- G. Mechanical items to be painted include, but are not limited to, the following:
  - 1. Piping, pipe hangers, and supports.
  - 2. Heat exchangers.
  - 3. Tanks.
  - 4. Ductwork.
  - 5. Insulation.
  - 6. Supports.
  - 7. Motors and mechanical equipment.
  - 8. Accessory items.
- H. Electrical items to be painted include, but are not limited to, the following:
  - 1. Conduit and fittings.
  - 2. Switch-gear.
- I. Block Fillers - Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- J. Prime Coats - Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appear, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- K. Stipple Enamel Finish - Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.

- L. Pigmented (Opaque) Finishes - Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- M. Transparent (Clear) Finishes - Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
  - 1. Provide satin finish for final coats.
- N. Completed Work - Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

### 3.4 FIELD QUALITY CONTROL

- A. The FAA reserves the right to invoke the following test procedure at any time and as often as the FAA deems necessary during the period when paint is being applied:
  - 1. The FAA will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
  - 2. The testing agency will perform appropriate tests for the following characteristics as required by the COR:
    - a. Quantitative materials analysis.
    - b. Abrasion resistance.
    - c. Apparent reflectivity.
    - d. Flexibility.
    - e. Washability.
    - f. Absorption.
    - g. Accelerated weathering.
    - h. Dry opacity.
    - i. Accelerated yellowness.
    - j. Recoating.
    - k. Skinning.
    - l. Color retention.
    - m. Alkali and mildew resistance.
  - 3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove non-complying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

### 3.5 CLEANING

- A. Cleanup - At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

### 3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to COR.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
  1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.7 INTERIOR PAINT SCHEDULE

- A. General - Provide the following paint systems for the various substrates, as indicated.
- B. Gypsum Drywall Systems:
  1. Lusterless (Flat) Emulsion Finish - Two coats.
    - a. Primer: White, interior, latex-based primer.
    - b. Finish Coat: Interior, satin, latex-based paint.
- C. Plaster:
  1. Semi-gloss Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.
    - a. Primer: Interior, flat, latex-based paint.
    - b. Undercoat: Interior enamel undercoat.
    - c. Finish Coat: Interior, semi-gloss, odorless, alkyd enamel.
- D. Steel, ungalvanized
  1. Semi-gloss Enamel Finish - Three coats.
    - a. Primer: Synthetic, dust-inhibiting primer.
    - b. Undercoat: Interior, semi-gloss, odorless, alkyd enamel.
    - c. Finish coat: Interior, semi-gloss, odorless, alkyd enamel.

END OF SECTION 09900

**DIVISION 10**

**SPECIALTIES**

SECTION 10100 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of visual display boards:
  - 1. Framed porcelain enamel dry marker boards (DMB) for liquid chalk, with chalk tray and map rails, and tack-board side panels.
- B. Related Sections - The following sections contain requirements that relate to this section:
  - 1. Section 06105 "Miscellaneous Carpentry" for wood blocking and grounds.

1.2 REFERENCE STANDARDS

- A. National Association Architectural Metal Manufacturers (NAAMM)

1.3 SUBMITTALS

- A. Product Data - Include standard product data and installation instructions for DMB applications.
- B. Shop Drawings - Provide shop drawings for DMB including clear coordination with Work of other Sections. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- C. Samples - Provide the following samples of each product for initial selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.
  - 1. Samples for initial selection of color, pattern, and texture:
    - a. Framed, Porcelain Enamel Dry Marker Board (DMB): Manufacturer's color charts consisting of actual sections of porcelain enamel finish showing the full range of colors available for each type of chalkboard and markerboard required.
  - 2. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated.
    - a. Marker-boards - Sample panels not less than 8-1/2 x 11 inches for each type of marker-board indicated. Include a sample panel for each color, texture, and pattern required.



- b. Composition Cork Tack-boards - Samples of each finish type and color, on 6 inch long sections of hardboard and not less than 4 inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sets showing the full range of variations expected.

#### 1.4 PROJECT CONDITIONS

- A. Field Measurements - Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
  - 1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

#### 1.5 WARRANTY

- A. Framed, Porcelain Enamel Dry Marker Board (DMB) Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.
  - 1. Warranty Period - Lifetime of the building.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Known Acceptable Source - Framed, Porcelain Enamel Dry Marker Board (DMB): No. 120 as manufactured by Best-Rite Chalkboard Co.

#### 2.2 MATERIALS

- A. Framed, Porcelain Enamel Dry Marker Board (DMB): Provide balanced, high-pressure-laminated porcelain enamel marker-board of 3-ply construction consisting of face sheet, core material, and backing.
  - 1. Face Sheet - Provide face sheet of 0.024-inch- enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures, but not less than 1450 deg F.

- a. Cover Coat - Provide the manufacturer's standard light-colored special writing surface with gloss finish intended for use with liquid felt-tipped markers.
  2. Core - Provide the manufacturer's standard 1/4-inch- thick tempered hardboard core material.
  3. Backing Sheet - Provide the manufacturer's standard 0.015-inch- thick aluminum sheet backing.
  4. Laminating Adhesive - Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.
- B. Composition Cork Tack-board - Formulation of cork granules, and used formaldehyde plastic on burlap backing. Color as selected by COR.
1. Outer Facing - Composition cork, 1/4 inch thick.
  2. Core - Hardboard, 3/8 inch thick.

## 2.3 ACCESSORIES

- A. Metal Trim and Accessories - Fabricate frames and trim of not less than 0.062 inch thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
1. Where the size of boards or other conditions exist that require support in addition to the normal trim, provide structural supports or modify the trim as indicated or as selected by the COR from the manufacturer's standard structural support accessories to suit the condition indicated.
  2. Chalk-tray - Furnish manufacturer's standard continuous box-type aluminum chalk-tray with slanted front and cast aluminum end closures for each chalkboard.

## 2.4 FABRICATION

- A. Framed, Porcelain Enamel Dry Marker Boards (DMB) - Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
1. Over 162 inches but not over 216 inches - 4 panels.
  2. Over 216 inches but not over 270 inches - 5 panels.
  3. Over 270 inches but not over 324 inches - 6 panels.
- B. Assembly - Provide factory-assembled markerboard and tack-board units, except where field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the COR.
2. Provide the manufacturer's standard vertical joint system between abutting sections of chalkboard.
3. Provide manufacturer's standard mullion trim at joints between markerboard sections.

## 2.5 FINISHES

- A. General - Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II Clear Anodized Finish - AA-M12C22A31 Mechanical Finish: as fabricated, non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Deliver factory-built markerboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the COR and as shown. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment. At DMB-2, terminate splines at inside edge of wood trim.
- B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
- C. Coordinate job-site assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

### 3.2 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units in accordance with the manufacturer's instructions. Break-in markerboards as recommended by the manufacturer.

END OF SECTION 10100

## SECTION 10155 - TOILET COMPARTMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes stock, manufactured toilet compartments.
- B. Types of toilet compartments include:
  - 1. High-Density Polyethylene (HDPE) polymer.
- C. Styles of toilet compartments include:
  - 1. Floor anchored/Overhead braced
- D. Styles of screens include:
  - 1. Wall-hung.
- E. Supports for attaching compartments to overhead structural system are specified in a Division 5 Section.
- F. Toilet accessories, such as toilet paper holders, grab bars, and purse shelves, are specified in another Division 10 Section.

#### 1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
  - 1. A 117.1 Accessible and Usable Buildings and Facilities.

#### 1.3 SUBMITTALS

- A. Product data for materials, fabrication, and installation including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop drawings for fabrication and erection of toilet compartment assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
- C. Samples of full range of colors for each type of unit required. Submit 6 inch square samples of each color and finish on same substrate to be used in work, for color verification after selections have been made.

#### 1.4 QUALITY ASSURANCE

- A. Field Measurements - Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of work. However, allow for adjustments where taking of field measurements before fabrication might delay work.
- B. Coordination - Furnish inserts and anchorage's which must be built into other work for installation of toilet compartments and related items. Coordinate delivery with other work to avoid delay.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Available Manufacturers - Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
  - 1. High-Density Polyethylene (HDPE) polymer
    - a. Accurate Partitions Corp.

##### 2.2 MATERIALS

- A. General - Provide HDPE materials shall have homogenous color throughout each component with 1/4" machined edges for uniformity. Self-lubricating surface shall resist markings from pens, pencils, and other writing instruments. Telegraphing of core material or other imperfections on finished units is not acceptable.
- B. Door, Panels, Pilaster and Urinal Screens – Shall be 1" thick HDPE polymer that is water resistant and non-absorbent. A heat sink shall be attached as standard to the bottom of all doors and panels.
- H. Hardware and Accessories - Manufacturer's standard design, heavy duty wraparound cam-action hinge set that permits door to return to a pre-set position when not locked. Operating hardware and accessories shall be of die-cast Zamac and through bolted with vandal resistant barrel nuts and shoulder screws. Hinge and slide latch assembly allow emergency access by lifting door from bottom.
- I. Anchorage's and Fasteners - Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass, finished to match hardware, with theft-resistant-type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel. Brackets shall be 54" long extruded aluminum with 6 through bolt panel attachment points. Panels shall be through bolted with tamper resistant barrel nuts and shoulder screws. Aluminum headrail with anti-grip profile shall provide overhead bracing and span all compartments and brace the end pilaster to the back wall

## 2.3 FABRICATION

- A. General - Furnish standard doors, panels, screens, and pilasters fabricated for compartment system. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.
- B. Door Dimensions - Unless otherwise indicated, furnish 24 inch wide in-swinging doors for ordinary toilet stalls and 32 inch wide (clear opening) out-swinging doors for stalls equipped for use by handicapped.
- C. Floor Mounted Partitions - Furnish supports and leveling bolts at finish floor, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing floor braces using manufacturer approved anchors to existing concrete floor. Furnish #4 finish trim shoe at each partition to conceal supports and leveling mechanism.
- D. Wall-Hung Screens - Furnish panel units in sizes indicated, of same construction and finish as partition system panels.
- E. Hardware - Furnish hardware for each compartment to comply with ANSI A117.1 for handicapped accessibility and as follows:
  - 1. Coat Hook - Manufacturer's standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.
  - 2. Door Pull - Manufacturer's standard unit for out-swinging doors. Provide pulls on both faces of handicapped compartment doors.

## 2.4 FINISH

- A. Color - One of manufacturer's standard colors in each room, as indicated or, if not indicated, as selected by COR.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General - Comply with manufacturer's recommended procedures and installation sequence. Install compartment units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels, and not more than 1 inch between panels and walls. Secure panels to walls with not less than two stirrup brackets attached near top and bottom of panel. Locate wall brackets so that holes for wall anchorage occur in masonry or tile joints. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.

- B. Overhead Braced Compartments - Secure pilasters to supporting structure and level, plumb, and tighten installation with devices furnished. Hang doors and adjust so that bottoms of doors are level with bottom of pilasters when doors are in closed position.
- C. Screens - Attach with anchoring devices as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.

**3.2 ADJUST AND CLEAN**

- A. Hardware Adjustment - Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors (and entrance swing doors) to return to fully closed position.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

**END OF SECTION 10155**



SECTION 10200 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fixed metal wall louvers.
2. Blank-off panels for wall louvers.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 07920, "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
2. Section 08110, "Steel Doors and Frames" for louvers in hollow metal doors and frames.
3. Section 15891, "Metal Ductwork" for ductwork connected to metal wall louvers.

1.2 REFERENCE STANDARDS

A. Air Movement and Control Association International, Inc. (AMCA)

1. 500 Test Methods for Louvers, Dampers.
2. 501 Application Manual for Air Louvers.

B. American Architectural Manufacturers Association

1. 605 Voluntary Specification for High-Performance Organic Coatings on Architectural Extrusions and Panels.

C. American Standard for Testing and Materials (ASTM)

1. A 526 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
2. A 527 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
3. B 209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
4. B 221 Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
5. E 90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

D. National Association of Architectural Metal Manufacturers (NAAMM)

- E. National Electrical Manufacturers Association (NEMA)
- F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- G. Steel Structures Painting Council (SSPC)
  - 1. Paint 12 Paint Specification No. 12 - Cold Applied Asphalt Mastic (Extra Thick Film).
  - 2. Paint 20 Paint Specification No. 20 Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic).
- H. Underwriters Laboratories Inc. (UL)

### 1.3 DEFINITIONS

- A. Louver Terminology - Refer to Air Movement and Control Association (AMCA) 501 for definitions of terms for metal louvers not otherwise defined in this Section or in referenced standards.

### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance - Engineer, fabricate, and install exterior metal wall louvers to withstand the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.
  - 1. Wind Load - Uniform pressure (velocity pressure) of 20 lbf per sq. ft., acting inwards or outwards.
  - 2. Wind Load - Uniform pressures (velocity pressures) indicated on Drawings, acting inwards or outwards.
  - 3. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
    - a. Temperature Change (Range) - 100 deg F.
- B. Air-Performance, Water-Penetration, and Air-Leakage Ratings - Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturer's stock units of height and width indicated. Test units according to AMCA 500.
  - 1. Perform testing on unpainted, cleaned, degreased units.
  - 2. Perform water-penetration testing on louvers without screens.

3. Equivalent Air-Performance Ratings - Louvers having less free area than that specified or having a lower free area velocity at the static pressure loss specified may be considered for the Work provided their total air performance is equivalent to that specified. The burden of proof of equivalency is on the Contractor. For louvers to be considered equivalent, the product of their free area, for the size specified, and their free area velocity at the static pressure loss specified must be at least equal to the product of the specified free area and velocity. Also, their free area velocity at the static pressure loss specified must not result in water penetration of more than 0.01 oz. per sq. ft. of free area, and they must meet all other requirements.
- C. Airborne Sound Transmission Loss - Provide acoustical louvers complying with airborne sound transmission loss ratings indicated, as demonstrated by testing manufacturer's stock units according to ASTM E 90.

#### 1.5 SUBMITTALS

- A. Product data for each type of product specified.
- B. Shop drawings of louver units and accessories. Include plans, elevations, sections, and details showing profiles, angles, and spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.
  1. For installed products indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.
- C. Wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring.
- D. Samples for verification of each type of metal finish required, prepared on samples of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
- E. Product test reports evidencing compliance of units with performance requirements indicated.
- F. Product certificates signed by louver manufacturers certifying that their products comply with the specified requirements and are licensed to bear the AMCA seal based on tests made according to AMCA 500 and complying with the AMCA Certified Ratings Program.
- G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility - Obtain louvers and vents from one source and by a single manufacturer where alike in one or more respects regarding type, design, and factory-applied color finish.
- B. Welding Standards - Comply with applicable provisions of D1.2 "Structural Welding Code--Aluminum," and D1.3 "Structural Welding Code--Sheet Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Engineer Qualifications - A professional engineer legally authorized to practice in the jurisdiction where the Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of louvers similar to this Project in material, design, and extent and that have a record of successful in-service performance.
- D. SMACNA Standard - Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.
- E. UL and NEMA Compliance - Provide motors and related components for motor-operated adjustable louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.7 PROJECT CONDITIONS

- A. Field Measurements - Check actual louver openings by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Known Acceptable Source - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Louvers -
    - a. Model K6742, 2 inch thick drainable blade louver, by Airolite Co.

## 2.2 MATERIALS

- A. Aluminum Extrusions - ASTM B 221, Alloy 6063-T5 or T-52.
- B. Aluminum Sheet - ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.
- C. Galvanized-Steel Sheet - ASTM A 526 or ASTM A 527, G90 zinc coating, mill phosphatized.
- D. Fasteners - Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.
  - 1. Use types and sizes to suit unit installation conditions.
  - 2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
- E. Anchors and Inserts - Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- F. Bituminous Paint - Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.
- G. Galvanizing Repair Paint - High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

## 2.3 FABRICATION, GENERAL

- A. General - Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.
- B. Assemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Maintain equal louver blade spacing to produce uniform appearance.
- E. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.

- F. Include supports, anchorages, and accessories required for complete assembly.
- G. Provide vertical mullions of type and at spacings indicated but not more than recommended by manufacturer, or 72 inches o.c., whichever is less. At horizontal joints between louver units, provide horizontal mullions except where continuous vertical assemblies are indicated.
- H. Provide sill extensions and loose sills made of same material as louvers where indicated or required for drainage to exterior and to prevent water penetrating to interior.
- I. Join frame members to one another and to fixed louver blades as follows, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary:
  - 1. With fillet welds, concealed from view; or mechanical fasteners; or a combination of these methods; as standard with louver manufacturer.

#### 2.4 FIXED, EXTRUDED-ALUMINUM WALL LOUVERS

- A. Horizontal, Drainable, Fixed-Blade Louvers - Extruded-aluminum frames and louver blades, designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and channels in jambs and mullions, complying with the following requirements:
  - 1. Louver Depth - 2 inches unless otherwise indicated.
  - 2. Frame Thickness - 0.125 inch, unless otherwise indicated.
  - 3. Blade Thickness - 0.125 inch, unless otherwise indicated.
  - 4. Blade Angle - 45 degrees, unless otherwise indicated.
  - 5. Performance Requirements - As follows, determined by testing units 48 inches wide by 48 inches high per AMCA 500:
    - a. Free Area - Not less than 52 percent.
    - b. Static Pressure Loss - Not more than 0.14 inch wg at an air flow of 900 fpm free area intake velocity.
    - c. Water Penetration - Not more than 0.01 oz. per sq. ft. of free area at an air flow of 900 fpm free area velocity when tested for 15 minutes.
- 15. AMCA Seal - Mark units with the AMCA Certified Ratings Seal.

#### 2.5 LOUVER SCREENS

- A. General - Provide louvers with screens at locations indicated.
  - 1. Screen Location for Fixed Louvers - Interior face, unless otherwise indicated.
  - 2. Screening Type - Insect screening where indicated.

- B. Secure screens to louver frames with stainless-steel machine screws, spaced 6 inches maximum from each corner and at 12 inches o.c. between.
- C. Louver Screen Frames - Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:
  - 1. Metal - Same kind and form of metal as indicated for louver frames to which screens are attached.
    - a. Reinforce extruded-aluminum screen frames at corners with clips.
  - 2. Finish - Same finish as louver frames to which louver screens are attached.
  - 3. Type - Rewireable frames with a driven spline or insert for securing screen mesh.
- D. Louver Screening for Aluminum Louvers - Fit aluminum louver screen frames with screening covering louver openings and complying with the following requirements:
  - 1. Insect Screening - 18-by-16 mesh formed with 0.012-inch- diameter aluminum wire.

## 2.6 BLANK-OFF PANELS

- A. General - Fabricate blank-off panels from materials and to sizes indicated and to comply with the following requirements:
  - 1. Finish - Match finish applied to louvers with respect to coating type, color, and gloss.
    - a. Color - As approved by the COR.
  - 2. Attach blank-off panels to back of louver frames with clips.
- B. Uninsulated, Blank-Off Panels - Metal sheet complying with the following requirements:
  - 1. Aluminum sheet for aluminum louvers, as follows:
    - a. Thickness - 0.050 inch, unless otherwise indicated.

## 2.7 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Finish louvers after assembly.

## 2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Coating Finish - AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish - acid chromate-fluoride-phosphate conversion coating; Organic Coating as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
  - 1. Fluoropolymer 2-Coat Coating System - Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
    - a. Color and Gloss - As approved by the COR.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

#### 3.2 INSTALLATION

- A. Locate and place louver units plumb, level, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items that cannot be refinished in the field to the shop, make required alterations, and refinish entire unit, or provide new units.
- F. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.



- G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation of louver.

### 3.3 ADJUSTING AND PROTECTION

- A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by COR, remove damaged units and replace with new units.
  - 1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

### 3.4 CLEANING

- A. Periodically clean exposed surfaces of louvers and vents that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Rinse surfaces thoroughly and dry.

END OF SECTION 10200

## SECTION 10265 - WALL SURFACE PROTECTION SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following types of wall surface protection systems:
  - 1. Wall protection systems, including:
    - a. Corner guards.
- B. Related Sections - The following Sections contain requirements that relate to this Section:
  - 1. Section 05500, "Metal Fabrications" for steel angle and bent plate corner guards fabricated from rolled metal sections.
  - 2. Section 06105, "Miscellaneous Carpentry" for wood blocking and grounds for surface-mounted wall guards, corner guards, and handrails.
  - 3. Section 08710, "Door Hardware" for stainless steel mop plates, kick plates, and armor plates.

#### 1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
  - ASTM B 221-90: Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
  - ASTM D 256-88: Standard Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials.
  - ASTM E 84-84: Test Method for Surface Burning Characteristics of Building Materials.

#### 1.3 SUBMITTALS

- A. Product data for each wall surface protection system component and installation accessory required, including installation methods for each type of substrate. Provide written data on each required component including physical characteristics, such as durability, resistance to fading, and flame resistance.
- B. Shop drawings showing locations, extent, and installation details of wall and corner guards, and other protection systems. Show methods of attachment to adjoining construction.
- C. Samples for Initial Selection - For initial selection of color, pattern and surface texture, provide the manufacturer's standard color chips consisting of actual sections of each vinyl plastic material required showing the full range of materials, colors, and textures available.

- D. Samples for Verification Purposes - Submit the following samples, prepared from the same material to be used in the Work, for verification of color, pattern, and texture selected and for compliance with requirements indicated:
  - 1. 12-inch long samples of each type of wall and corner guard required. Include examples of joinery, corners, and field splices.
  - 2. 6 x 6 inch square samples of each rigid sheet or panel type wall surface protection material required.
- E. Product test reports from a qualified independent testing laboratory showing compliance of wall surface protection system components with requirements indicated based on tests performed by the laboratory within the past five years.
- F. Maintenance data for wall surface protection system components for inclusion in the Operating and Maintenance Manuals specified in Division 1.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications - Engage an experienced Installer who has previously installed wall surface protection systems similar in material, design, and extent to the systems indicated for this Project.
- B. Manufacturer Qualifications - Firm experienced in manufacturing wall surface protection system components that are similar to those required for this Project and that have a record of successful in-service performance.
- C. Fire Performance Characteristics - Provide wall surface protection system components that are identical to those tested in accordance with ASTM E 84 for the fire performance characteristics indicated below. Identify wall surface protection system components with appropriate markings from the testing and inspection organization.
  - 1. Flame Spread - 25 or less.
  - 2. Smoke Developed - 450 or less.
- D. Impact Strength - Provide wall surface protection system components with a minimum impact resistance of 25.4 ft. x lb/sq. ft. when tested in accordance with ASTM D 256 (Izod impact, ft. x lb/in. notch).
- E. Single Source Responsibility - Obtain each color, grade, finish, and type of wall surface protection system component from a single source with resources to provided products of consistent quality in appearance and physical properties without delaying progress of the Work.
- F. Design Criteria - The drawings indicate the size, profile and dimensional requirements of wall surface protection system components required and are based on the specific types and models indicated. Wall surface protection system components by other manufacturers may be

considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the COR. The burden of proof of equality is on the proposer.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classification.
- B. Store wall surface protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within the storage area at not less than 70 deg F during the period plastic materials are stored. Keep sheet material out of direct sunlight to avoid surface distortion.
  - 2. Store rigid plastic corner guard covers in a vertical position, and rigid plastic wall guard and handrail covers in a horizontal position for a minimum of 72 hours, or until the plastic material attains the minimum room temperature of 70 deg F.

**1.6 PROJECT CONDITIONS**

- A. Environmental Conditions - Do not install wall surface protection system components until the space is enclosed and weatherproof and until the ambient temperature within the building is maintained at not less than 70 deg F for not less than 72 hours prior to beginning of the installation. Do not install rigid plastic wall surface protection systems until that temperature has been attained and is stabilized.

**1.7 MAINTENANCE**

- A. Maintenance Instructions - Provide the manufacturer's instructions for maintenance of installed work. Include recommended methods and frequency for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.
- B. Replacement Materials - After completion of work, deliver not less than 2 percent of each type, color, and pattern of wall surface protection materials and components. Include accessory components as required. Replacement materials shall be from the same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Known Acceptable Source - As indicated in Interior Finish Material Schedule, and as follows:

1. Corner Guards - Acrovyn SM-20 by Construction Specialties, Inc.

## 2.2 MATERIALS

- A. Rigid Plastic Material - Extruded, textured, chemical- and stain-resistant, high-impact, polyvinyl chloride (PVC) or acrylic modified vinyl plastic, thickness as indicated. Comply with specified requirements of ASTM D 256 for impact resistance and ASTM E 84 for flame spread and smoke developed characteristics.
1. Colors and Textures of Plastic Material - Provide extruded plastic material that matches selections made by the COR from the manufacturer's full range of standard colors and textures.
- B. Polycarbonate Plastic Sheet - Abrasion-resistant, clear, transparent polycarbonate plastic sheet with an impact-resistant rating of 16 ft. x lb/in. when tested in accordance with ASTM D 256.
- C. Copolymer Plastic Sheet - Abrasion-resistant, clear, transparent copolymer plastic sheet with an impact-resistant rating of 16 ft. x lb/in. when tested in accordance with ASTM D 256.
- D. Fasteners - Provide aluminum, nonmagnetic stainless steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with aluminum components, hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

## 2.3 CORNER GUARDS

- A. Surface-Mounted, high impact vinyl/acrylic Corner Guards - Provide surface-mounted, high impact vinyl/acrylic corner guard assembly consisting of a snap-on-type vinyl/acrylic cover installed over a continuous aluminum retainer, height as indicated.
1. Cover shall be rigid, impact-resistant vinyl/acrylic, minimum 0.078 inch thick, in dimensions and profiles indicated.
    - a. Corner Radius - 1/4 inch.
    - b. Wing Size - 3 inch x 3 inch wings.
  2. Retainer - Manufacturer's standard continuous, one-piece, extruded aluminum retainer, minimum 0.062 inch thick.
  3. Accessories - Provide prefabricated, injection-molded top cap and aluminum base with concealed splices, cushions, mounting hardware, and other accessories as required.

- a. Top caps shall match color of plastic covers and shall be field adjustable for close alignment with snap-on plastic covers.

## 2.5 FABRICATION

- A. General - Fabricate wall and door protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thicknesses of components.
- B. Preassemble components in the shop to the greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of evidence of wrinkling, chipping, uneven coloration, dents, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
- D. Brackets, Flanges, Fittings, and Anchors - Provide wall brackets, flanges, miscellaneous fittings, and anchors for interconnection of members to other construction.
- E. Provide inserts and other anchorage devices for connecting components to concrete or masonry. Fabricate anchoring devices to be capable of withstanding imposed loads. Coordinate anchoring devices with the supporting structure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.
  - 1. Complete all finishing operations, including painting, before beginning installation of wall surface protection system materials.
- B. Impact-Resistant Wall Covering Materials - Wall surfaces to receive impact-resistant wall covering materials shall be dry and free from dirt, grease, loose paint, and scale.
- C. Do not proceed with installations until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General - Prior to installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

- A. General - Install wall surface protection units plumb, level, and true to line without distortions.
  - 1. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.
- B. Install aluminum retainers, mounting brackets, and other accessories in strict accordance with the manufacturer's instructions.
  - 1. Where splices occur in horizontal runs of over 20 feet, splice aluminum retainer and plastic cover at different locations along the run.

### 3.4 CLEANING

- A. General - Immediately upon completion of installation, clean plastic covers and accessories using a standard ammonia based household cleaning agent. Clean metal components in accordance with the manufacturer's recommendations.
- B. Remove excess adhesive using methods and materials recommended by manufacturer.
- C. Remove surplus materials, rubbish, and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

END OF SECTION 10265

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Fire extinguishers.
  - 2. Fire extinguisher cabinets.
  - 3. Fire extinguisher mounting brackets.

1.2 REFERENCE STANDARDS

- A. National Association of Architectural Metal Manufacturers (NAAMM)
- B. National Fire Protection Association (NFPA)
  - 1. 10 Standard for Portable Fire Extinguishers
- C. Steel Structures Painting Council (SSPC)
  - 1. SP 1 Surface Preparation Specification No. 1 Solvent Cleaning.
  - 2. SP 5 Surface Preparation Specification No. 5 White Metal Blast Cleaning.
  - 3. SP 8 Surface Preparation Specification No. 8 Pickling.
- D. Underwriters Laboratories (UL)

1.3 SUBMITTALS

- A. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
  - 1. Show location of knockouts for hose valves.
- B. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.
- C. Samples for verification purposes in full-size units of each type of cabinet finish indicated, and in sets for each color, texture, and pattern specified, showing the full range of variations.



#### 1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility - Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. Coordination - Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Government under separate Contract.
- C. UL-Listed Products - Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.
- D. FM-Listed Products - Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Known Acceptable Source, Fire Extinguisher - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. J.L. Industries Cosmic 10E at 10 pound BC.
- B. Known Acceptable Source, Fire Extinguisher Cabinet - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. J.L. Industries Ambassador 1015F10FX with FE letters.

#### 2.2 FIRE EXTINGUISHERS

- A. General - Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Government from manufacturer's standard, that comply with authorities having jurisdiction.

#### 2.3 MOUNTING BRACKETS

- A. Brackets - Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.
  - 1. Provide brackets for extinguishers not located in cabinets.

#### 2.4 CABINETS

- A. Construction - Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- B. Fire-Rated Cabinets - UL listed with UL listing mark with fire-resistance rating of wall where it is installed.
- C. Cabinet Type - Suitable for containing the following:
  - 1. Fire extinguisher.
- D. Cabinet Mounting - Suitable for the following mounting conditions:
  - 1. Recessed - Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.
- E. Trim Style - Fabricate trim in one piece with corners mitered, welded, and ground smooth.
  - 1. Trimless with hidden flange of same metal and finish as box (tub) that overlaps surrounding wall finish and concealed from view by an overlapping door.
- F. Door Material and Construction - Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
  - 1. Enameled Steel - Manufacturer's standard finish, hollow steel door construction with tubular stiles and rails.
- G. Door Style - Manufacturer's standard design.
- H. Door Hardware - Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

## **2.5 FINISHES FOR CABINETS, GENERAL**

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

## **2.6 STEEL CABINET FINISHES**

- A. Surface Preparation - Solvent-clean surfaces complying with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).
- B. Factory-Priming for Field-Painted Finish - Apply shop primer specified below immediately following surface preparation and pretreatment.
  - 1. Shop Primer - Manufacturer's or fabricator's standard fast-curing, lead-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Baked-Enamel Finish - Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.
  - 1. Color and Gloss - Match adjacent wall surfaces unless indicated otherwise by COR.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine rough-in for hose vales, hose racks, and cabinets to verify locations of piping connections prior to cabinet installation.
- B. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.
- C. Do not proceed until unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Follow manufacturer's printed instructions for installation.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.
  - 1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
  - 2. Fasten mounting brackets and cabinets to structure, square and plumb.

#### 3.3 INSTALLATION OF FIRE-RATED HOSE OR VALVE CABINET

- A. Install cabinet with not more than 1/16-inch tolerance between pipe o.d. and knockout o.d.  
Center pipe within knockout.
- B. Seal through penetrations with one-part fire-stopping sealant.

END OF SECTION 10522

## SECTION 10655 - ACCORDION FOLDING PARTITIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Manually operated accordion folding partitions.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Metal framing and supports are specified in Section 05500, "Metal Fabrications."
  - 2. Wood framing and supports are specified in Section 06105, "Miscellaneous Carpentry."

#### 1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. C 423            Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
  - 2. E 84            Test Method for Surface Burning Characteristics of Building Materials.
  - 3. E 90            Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
  - 4. E 413           Classification for Rating Sound Insulation.
  - 5. E 557           Practice for Architectural Application and Installation of Operable partitions.
- B. Underwriters Laboratories (UL)

#### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide accordion folding partitions tested by a qualified independent testing agency for the following acoustic properties according to the following test method:
  - 1. Sound Transmission Requirements: Accordion folding partition tested for laboratory sound transmission loss performance according to ASTM E 90, determined by ASTM E 413 and rated for a STC plus or minus 1 as follows:
    - a. Sound Transmission Class (STC): 39.
  - 2. Noise Reduction Requirements: Accordion folding partition tested by a qualified independent agency for compliance with ASTM C 423 and rated for an NRC as follows:
    - a. Noise Reduction Coefficient (NRC): 0.50.

#### 1.4 SUBMITTALS

- A. Product data for each type of accordion folding partition and accessory specified. Include installation methods for each type of substrate.
- B. Shop drawings showing location and extent of accordion folding partitions. Include plans, elevations, large-scale details of anchorage's, and accessory items. Indicate unit conditions at openings, location and installation requirements for hardware, and direction of travel.
  - 1. Include location and installation requirements for electric operators.
- C. Template drawings prepared by manufacturer showing location of items supported or anchored by permanent construction.
- D. Samples for initial selection purposes in the form of manufacturer's color charts showing the full range of colors, textures, and patterns available for each finish indicated.
- E. Product certificates signed by accordion folding partition manufacturers certifying that their products comply with specified requirements.
- F. Maintenance data for partition to include in the "Operating and Maintenance Manual" specified in Division 1.
  - 1. Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is certified in writing by the accordion folding partition manufacturer as qualified to install the manufacturer's partition systems.
- B. Surface-Burning Characteristics: Provide a partition finish face with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 450 or less.

#### 1.6 EXTRA MATERIALS

- A. Extra Materials: Furnished from same production run as materials installed. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.
  - 1. Finish Face Material: Furnish a quantity of full-size units equal to 5 percent of the amount installed.

#### 1.7 WARRANTY

- A. Installation shall be guaranteed against defects in material and workmanship for a period of 2 years from date of installation and acceptance for beneficial use. In addition, the pantographs, trolleys, and tracks shall be guaranteed for 10 years from date of installation, acceptance, and beneficial use.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Hufcor, Series 4200.

### 2.2 SUSPENSION SYSTEMS

- A. Carriers: Four-wheel ball-bearing carriers at lead post and two-wheel ball-bearing carriers at intermediate spacing as required for type, size, and weight of partition.
- B. Tracks: Manufacturer's standard extruded aluminum or steel track with factory-applied corrosion-resistant finish. Track deflection, independent of structural supporting system, shall be no more than 80 percent of bottom clearance.
  - 1. Track: Recessed with prefinished ceiling guard.

### 2.3 POSTS AND SEALS

- A. Lead Posts and Jamb Posts: Formed to provide rigidity for partition and light seal at adjacent construction.
  - 1. Post Type: Intermediate post, one side.
- B. Seals: Perimeter sweep strips for each side, top, and bottom, providing continuous contact with head and sill surfaces for positive light and sound seal. Include manufacturer's standard male and female sound and light seal at lead post and jamb.

### 2.4 FINISH SURFACE

- A. Material: Manufacturer's standard mildew-resistant vinyl, complying with FS CCC-W-408, for Type II material.

### 2.5 HARDWARE

- A. Hardware: Manufacturer's standard heavy-duty manually operated pulls and latches.
  - 1. Latches: Operable from both sides of closed partitions.
  - 2. Locks: Provide master key locks keyed to match locks specified in 08710 Door Hardware.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine flooring for compliance with requirements for installation tolerances and other conditions affecting the performance of accordion folding partitions.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install accordion folding partitions and accessories complying with ASTM E 557 after other finishing, including painting, has been completed.
- B. Repair or replace accordion folding partitions within areas where test results indicate partitions do not comply with requirements, and retest partitions.

#### 3.3 ADJUSTING

- A. Lubricate bearings and sliding parts. Adjust to ensure smooth, easy operation.

#### 3.4 CLEANING

- A. Clean all accordion folding partition surfaces and adjacent surfaces. Avoid abrasive cleaners or solutions containing corrosive solvents. Use cleaning materials recommended by the manufacturer.

END OF SECTION 10655



## SECTION 10800 - TOILET AND BATH ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes toilet and bath accessory items as scheduled.
- B. Mirrored glass for frameless applications is specified in Section 08830, "Mirrored Glass."
- C. Toilet compartments and related accessories are specified in Section 10155.

#### 1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. A 153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 2. A 366 Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
  - 3. A 527 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-forming Quality.
  - 4. B 456 Specification for Electro-deposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
  - 5. F 446 Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.

#### 1.3 SUBMITTALS

- A. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- B. Samples of each toilet accessory item to verify design, operation, and finish requirements. Acceptable full-size samples will be returned and may be used in the Work.
- C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.
- D. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- E. Maintenance instructions including replaceable parts and service recommendations.

#### 1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages - Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
- B. Single-Source Responsibility - Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to COR.

## 1.5 PROJECT CONDITIONS

- A. Coordination - Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

## 1.6 WARRANTY

- A. Warranty - Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.
- B. Warranty Period - 15 years from date of Final Acceptance by the Government.
- C. The warranty shall not deprive the Owner of other rights the Government may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers - Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:
  - 1. A & J Washroom Accessories.
  - 2. American Specialties, Inc.
  - 3. Bobrick Washroom Equipment, Inc.
  - 4. Bradley Corporation.
  - 5. General Accessory Manufacturing Co.
  - 6. McKinney/Parker.

### 2.2 MATERIALS, GENERAL

- A. Stainless Steel - AISI Type 302/304, with satin finish, 0.034 inch minimum thickness.

- B. Sheet Steel - Cold-rolled, commercial quality ASTM A 366, 0.04 inch minimum. Surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet - ASTM A 527 G60.
- D. Chromium Plating - Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- E. Galvanized Steel Mounting Devices - ASTM A 153, hot-dip galvanized after fabrication.
- F. Fasteners - Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

## 2.3 TOILET TISSUE DISPENSERS

- A. Double-Roll Dispenser - Size to accommodate two separate rolls of core type tissue to 5 inch diameter roll. (Bobrick B-6867)

## 2.4 COMBINATION TOWEL DISPENSER/WASTE RECEPTACLE UNITS

- A. Recessed Unit - Stainless steel combination unit fabricated for nominal 10 1/2 inch wall depth with continuous, seamless wall flange. Towel compartment in upper portion of unit designed to dispense 8" or 9" x 800" roll paper towel. Waste receptacle in lower portion of unit provided with reusable, heavy-duty vinyl liner, minimum 18 gallon capacity (Bradley 227).

## 2.5 GRAB BARS (Bobrick B-6206)

- A. Stainless Steel Type - Provide grab bars with wall thickness not less than 0.05 inch and as follows:
  - 1. Mounting - Concealed, manufacturer's standard flanges and anchorage's.
  - 2. Clearance - 1-1/2 inch clearance between wall surface and inside face of bar.
  - 3. Gripping Surfaces - Smooth, satin finish.
  - 4. Heavy-Duty Size - Outside diameter of 1-1/2 inches.

## 2.6 SANITARY NAPKIN VENDORS (Bobrick B-3500X2)

- A. General - Fabricate cabinet of stainless steel, not less than 0.034 inch thick, all-welded construction. Provide door of seamless stainless steel, minimum 0.05 inch thick, with returned edges and equipped with tumbler lockset. Provide identification reading "Napkins" and "Tampons" at coin slots; brand name advertising is not allowed. Capacity not less than 31 napkins and 22 tampons.
  - 1. Mounting - Fully recessed type for nominal 4 inch thick wall.
  - 2. Operation - Fifty-cent coin operation, with locked coin box keyed separately from door and other accessory units.

2.7 SANITARY NAPKIN DISPOSAL UNITS

- A. Partition-Mounted, Dual-Access Type - Fabricate of stainless steel equipped with adjustable flanges to permit partition mounting to service two toilet compartments. Provide self-closing door and all-welded, stainless steel receptacle removable from one side. (Bobrick B-354).
- B. Surface-Mounted Type - Fabricate of stainless steel with seamless exposed walls, tightly self-closing top cover and locking bottom panel with continuous, stainless steel piano hinge. (Bobrick B-254).

2.8 SOAP DISPENSERS

- A. Liquid Soap Dispenser, Deck-Mounted - Deck-mounted piston and spout-type unit with a minimum 32 fluid ounce capacity, polyethylene reservoir concealed below deck. Piston and 4 inch long spout of stainless steel with brightly polished finish with chrome-plated deck escutcheon. (Bobrick B-822).
  - 1. Provide unit designed for mounting on vanity deck.
  - 2. Equip unit with valve for dispensing soap in liquid form.

2.9 UTILITY SHELF (Bobrick B-224)

- A. Mop and Broom Holder/Utility Shelf - Combination unit with 0.05 inch, Type 304, stainless steel shelf with 1/2 inch returns, 0.062 inch support brackets for wall mounting. Provide 0.062 inch stainless steel hooks for wiping rags on front of shelf, together with spring-loaded, rubber hat, cam-type mop/broom holders; 1/4 inch diameter stainless steel drying rod suspended beneath shelf. Provide unit 36 inches long and complete with four mop/broom holders and three hooks.

2.10 SEAT COVER DISPENSERS

- A. Surface mounted type, fabricated of stainless steel for nominal 2 inch depth (Bobrick B-221).

2.11 FABRICATION

- A. General - Only a maximum 1-1/2 inch diameter, unobtrusive stamped manufacturer logo, as approved by COR, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. General - No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.

- C. Surface-Mounted Toilet Accessories, General - Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- D. Recessed Toilet Accessories, General - Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- E. Keys - Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to COR.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

#### 3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

**DIVISION 12**

**FURNISHINGS**

## SECTION 12511 - HORIZONTAL LOUVER BLINDS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes venetian blinds.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 06105, "Miscellaneous Carpentry" for wood blocking and grounds for mounting horizontal louver blinds.
  - 2. Section 08510, "Exterior Security Aluminum Windows" for windows with horizontal louver blinds mounted on window frames.

#### 1.2 REFERENCE STANDARDS

- A. American Window Covering Manufacturers Association (AWCMA)
  - 1. Document 1029 Venetian Blinds
- B. National Fire Protection Association (NFPA)
  - 1. 701 Standard Methods of Fire Test for Flame-Resistant Textiles and Films.
- C. Underwriters Laboratories (UL)

#### 1.3 SUBMITTALS

- A. Product data for each type of horizontal louver blind specified. Include printed data on physical characteristics.
- B. Shop drawings showing location and extent of blinds. Show installation details at and relationship to adjoining work. Include elevations indicating blind units. Indicate location of blind controls.
- C. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors, textures, and patterns available for each type of horizontal louver blind indicated.
- D. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare samples from the same material to be used for the Work.
  - 1. Louver - Manufacturer's standard-size unit, not less than 12 inches long.

2. Valance - Manufacturer's standard-size unit, not less than 12 inches long.
- E. Schedule of horizontal louver blinds using same room designations indicated on Drawings.
- F. Maintenance data for horizontal louver blinds to include in the operation and maintenance manual. Include the following:
  1. Methods for maintaining horizontal louver blinds and finishes.
  2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

#### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics - Provide horizontal louver blinds identical to those tested for the following fire-test-response characteristics as determined by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
  1. Test Method - NFPA 701.
  2. Rating - Pass
- B. Single-Source Responsibility - Obtain each type of horizontal louver blind from one source and by a single manufacturer.
- C. Mockups - Prior to installing horizontal louver blinds, construct mockups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
  1. Locate mockups on-site in location and of size indicated or, if not indicated, as directed by COR.
  2. Notify COR one week in advance of the dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain COR's acceptance of mockups before start of final unit of Work.
  5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    - a. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

#### 1.5 PROJECT CONDITIONS

- A. Field Measurements - Check actual horizontal louver blind dimensions by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.



- B. Space Enclosure and Environmental Limitations - Do not install horizontal louver blinds until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

## 1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. Horizontal Louver Blinds - Before installation begins, furnish quantity of full-size units equal to 5 percent of amount of each size installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Known Acceptable Source - Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Horizontal Louver Blinds -
    - a. Levolor.

### 2.2 HORIZONTAL LOUVER BLINDS

- A. Louvers - Manufacturer's standard as follows:
  - 1. Aluminum, 1 inch wide.
- B. Tilt Operation - Manual with wand.
- C. Cord-Lock Operation - Top-locking cord lock; locks pull cord to stop blind in either fully opened or fully closed position only and is equipped with a ring pull not more than 10 inches long.
  - 1. Position of Cord Lock - Right side, unless otherwise indicated.
- D. Cord Equalizers - Self-aligning to maintain horizontal louver blind position.
- E. Mounting - Ceiling.

- F. Colors and Patterns - Where manufacturer's standard products are indicated, provide horizontal louvers complying with the following requirements:

1. Provide COR's selections from manufacturer's full range of colors and patterns for horizontal louver blinds of type indicated.

## 2.3 FABRICATION

- A. Product Standard and Description: Comply with AWCMA Document 1029 for each horizontal louver blind unit consisting of louvers, rails, cord locks, tilting mechanisms, tapes, and installation hardware.
- B. Lifting and Tilting Mechanisms - Non-corrosive, self-lubricating materials.
- C. Unit Sizes - Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Blind Units Installed Between (Inside) Jambs - Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb to jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head to sill dimension of opening in which each blind is installed.
- D. Installation Fasteners - Not less than 2 fasteners per bracket, fabricated from metal non-corrosive to blind hardware and adjoining construction; support blind units under conditions of normal use.
- E. Hold-Down Brackets - Manufacturer's standard, as indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of horizontal louver blinds. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install blinds level, plumb, and located so exterior louver edges in any position are not closer than 1 inch to interior face of glass lites.
1. Flush Mounted - Install blinds with louver edges flush with finish face of wall unless otherwise noted.

3.3 ADJUSTING

- A. Adjust components and accessories for proper operation.

3.4 CLEANING

- A. Clean blind surfaces, according to manufacturer's instructions, after installation.
- B. Remove surplus materials, packaging, rubbish, and debris resulting from installation. Leave installation areas neat, clean, and ready for use.

3.5 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensure that horizontal louver blinds are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 12511

## **DIVISION 13**

# **FIRE ALARM & DETECTION SYSTEMS**

**SECTION 13700 – ACCESS CONTROL SYSTEM**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the material and work required to install access control system devices on the Automation Wing Second Floor doors due to the replacement of the doors. This includes replacement/reinstallation of the devices and installation of cables in concealed conduit.
- B. The existing system is Johnson Controls, Inc., Cardkey CK720 panel and Pegasys 2000 system. The affected door devices are connected to an expansion panel located in room 222A.

**1.2 RELATED DOCUMENTS**

- A. Section 08710, "Door Hardware" for door locking hardware and devices.
- B. Section 16050, "Basic Electrical Materials and Methods" contains requirements that relate to this Section.
- C. Section 16100, "Raceways, Boxes, and Cabinets" contains requirements that relate to this Section.
- D. Section 16120, "Wires and Cables" contains requirements that relate to this Section.
- E. Section 16195, "Electrical Identification" contains requirements that relate to this Section.
- F. Section 16452, "Grounding" contains requirements that relate to this Section.

**1.3 REFERENCE STANDARDS - Applicable only to the extent specified.**

- A. Electronic Industries Association/Telecommunications Industry Association (EIA/TIA) Publications.-
  - 568 Commercial Building Telecommunications Wiring Standard
  - 569 Commercial Building Standard For Telecommunications Pathways and Spaces
- B. Federal Aviation Administration (FAA)
  - 1. C-1217f Electrical Work, Interior
  - 2. Std-019e Lightning Protection, Grounding, Bonding, and Shielding Requirements for Facilities
- C. National Fire Protection Association (NFPA)
  - 1. 70 National Electrical Code (NEC)
- D. Underwriters Laboratories (UL)

1. 50                      Enclosures for Electrical Equipment

1.3            SUBMITTALS

- A.    Complete list of equipment and materials.
- B.    Product data for each type of equipment supplied, including: manufacturer's descriptive and technical literature; performance charts and curves; catalog cuts; and installation instructions.
- C.    Complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function as a unit. Drawings shall show proposed layout of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation. Identify terminals to facilitate installation, operation, and maintenance. Differentiating is clearly between manufacturer-installed and field-installed wiring.
- D.    Installer certificates signed by manufacturer certifying that Installers comply with requirements specified under the "Quality Assurance" Article. Upon request, submit evidence of experience and of relationship with system manufacturer.
- E.    Manufacturer certificates signed by manufacturer certifying that manufacturers comply with requirements specified under the "Quality Assurance" Article. Upon request, submit evidence of manufacturing experience.
- F.    Report of field tests and observations, including record of final tap settings of speaker line matching transformers and signal ground-resistance measurement certified by Installer.
- G    Maintenance data for system to include in the operation and maintenance manual specified in Section 16050, "Basic Electrical Materials and Methods."

1.4            QUALITY ASSURANCE

- A.    Installer Qualifications: Engage a factory-authorized Installer to perform work of this Section. Installer shall have a minimum of 5 years experience in design, installation, and testing of access control systems. Submit a list of systems of similar nature and scope, successfully completed within the last two years and provide proof of available telephone communications on a 24 hour, seven day a week basis. Be able to provide replacement parts on an emergency basis, and have experienced service personnel available for emergency service.
- B.    Comply with NFPA 70.
- C.    Comply with UL 50.

**PART 2 - PRODUCTS**

2.1            GENERAL

- A.    Materials procured and installed in this Section shall be in accordance with FAA C-1217f and FAA Std-019b.

- B. Materials and equipment provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. All components used in the system shall be commercial designs that comply with the requirements specified.
- C. Re-use the existing CardReaders (CR), and Passive Infrared Sensors (PIR). Provide new door magnetic contacts. Install/connect the new door hardware (as provided in Section 08710, Door Hardware) such as electric lock and electric hinge.

## 2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that are compatible with the existing access control system.

## 2.3 SYSTEM REQUIREMENTS

- A. Coordinate with the COR for the existing system wiring diagram and requirement.

## 2.4 EQUIPMENT

- A. For door magnetic contacts, use GE Interlogix Magnetic Contacts 1076 series for steel doors.
- D. Wire and Cable: Cables must be per the cable schedule as shown on plan.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. General: Install equipment to comply with manufacturer's written instructions and in accordance with FAA C-1217f and FAA Std-019b.
- B. Wiring Method: Install wiring in raceway. Raceway shall extend from the second floor to the location of the amplifier in the Automation Wing Basement.
- C. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets, and equipment enclosures.
- D. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.

## 3.2 GROUNDING

- A. Ground cable equipment to eliminate shock hazard and to minimize ground loops, common mode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate at existing amplifier. Connect signal ground to main building ground system.

## 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the testing and adjustment of the system.
- B. Testing Procedure: Conform to the following:
  - 1. Test Plan: Submit a test plan to the COR for approval at least 30 days prior to conducting the acceptance tests. The test plan shall describe the test procedures, explaining in detail, step by step actions and expected results to demonstrate compliance with the requirements specified. The plan shall also explain methods for simulating the necessary conditions of operation to demonstrate system performance.
  - 2. Schedule tests with the COR, a minimum of 7 days in advance of performance.
  - 3. Acceptance Test: Conduct acceptance tests utilizing the approved test procedures to demonstrate that the equipment operates in accordance with specification requirements. The tests must include operations of the cardreaders to initiate the electric lock to unlock for valid entry. For the exiting, the PIR would shunt the alarm for valid exiting. For forced entry, test the door by using the key to open the door and verify at the system station for the forced entry alarm.
  - 4. Report: Submit a written record of test results.
- C. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

END OF SECTION 13700



**SECTION 13850**

**FIRE ALARM AND DETECTION SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Section 08710, "Door Hardware" for door hold/release devices.
- B. Section 15325, "Automatic On/Off Sprinkler System" for coordinating sprinkler system alarm, trouble, power, and valve tamper switch monitoring requirements that relate to this Section.
- C. Section 15975, "Control Systems - Electronic and Direct Digital Controls" for coordinating interface between FACP and Direct Digital Control System.
- D. Section 16050, "Basic Electrical Materials and Methods" contains requirements that relate to this Section.
- E. Section 16100, "Raceways, Boxes, and Cabinets" contains requirements that relate to this Section.
- F. Section 16120, "Wires and Cables" contains requirements that relate to this Section.
- G. Section 16452, "Grounding" contains requirements that relate to this Section.
- H. Section 16195, "Electrical Identification" contains requirements that relate to this Section.

**1.2 REFERENCE STANDARDS**

- A. Americans with Disabilities Act (ADA)
  - 1. ADA Accessibility Guidelines for Buildings and Facilities
- B. Electronic Industries Association (EIA):
  - 1. TIA-422 Electrical Characteristics of Balanced Voltage Digital Interface Circuits.
- C. Factory Mutual System Publication (FM)
  - 1. Factory Mutual Approval Guide
- D. National Fire Protection Association (NFPA)
  - 1. 12A Halon 1301 Fire Extinguishing Systems
  - 2. 13 Installation of Sprinkler Systems
  - 3. 70 National Electrical Code
  - 4. 72 National Fire Alarm Code
  - 5. 90A Installation of Air Conditioning and Ventilating Systems
  - 6. 101 Safety to Life from Fire in Buildings and Structures

E. Occupational Safety and Health Administration (OSHA)

1. 1910.7 Nationally Recognized Testing Laboratories (NRTL)

F. Underwriters Laboratories Inc. (UL)

1. 38 Manually Actuated Signaling Boxes.
2. 268 Smoke Detectors for Fire Protective Signaling Systems.
3. 268A Smoke Detectors for Duct Applications.
4. 464 Audible Signal Appliances.
5. 521 Heat Detectors for Fire Protective Signaling Systems.
6. 864 Control Units for Fire Protective Signaling Systems.
7. 1481 Power Supplies for Fire protective Signaling Systems.
8. 1971 Visual Signaling Appliances for the Hearing Impaired.

1.3 AIR TRAFFIC CONTROL EQUIPMENT RESTRICTIONS

- A. Job conditions: Do not permit interference with the air traffic control function at the Center. Schedule and plan work to permit normal facility operations to continue with minimum of disruption. Access to the facility shall be kept unobstructed at all times. If interference with the existing facility operations seems to be unavoidable, advise the COR 10 days prior to such interference. Proceed as directed by the COR.
- B. Equipment Shutdown: Each ARTCC maintains air traffic control continuously without shutdown. Various techniques are employed to achieve maximum system availability. Mechanical and electrical systems in direct support of air traffic operation and environmental systems have redundant configurations. Shutdown of equipment shall be scheduled with the COR at least 10 days prior to the contractor's need. The reliability of mechanical and electrical systems is compromised when redundant equipment is not available. Every effort will be made by the Government to allow work to be accomplished during the Contractor's normal working hours; however, the COR may require that certain equipment be shut down during off normal hours and be restored to service immediately after this period. See drawing G108 for list of off normal hours. Shutdown shall be accomplished by Government personnel.

1.4 SUMMARY

- A. This specification section provides the requirements for expanding the existing Siemens Cerberus MXL FACP analog addressable fire alarm life-safety control system to serve the Automation Wing Second Floor and Attic.
  1. The system shall be a complete and fully operational fire detection and alarm system designed, engineered, furnished, installed, and tested in accordance with NFPA 72, this Section, and the drawings. The shop drawings and design calculations shall be signed and sealed by a licensed Professional Fire Protection Engineer. The design shown on the plans intended as a general guide to the contractor.
  2. The system is not limited to the Fire Alarm Control Panel (FACP) interface boards, FACP power supplies, FACP batteries, smoke detectors, duct smoke detectors, manual pull stations,

addressable interface and control devices, audible and visual alarms, wiring, conduits, signs, and appurtenances. The contractor must utilize the existing Siemens Cerberus MXL FACP, Supplementary Notification Appliance Circuit Panel (SNAC-4) and its backup batteries. The contractor must calculate if the existing batteries are capable for backing up the revised new fire detection plan and upsize the batteries if required.

3. As part of the FACP relocation, the FACP must be connected and networked to other FACP's in the facility. Extend the existing network wiring to the new FACP location as required for the network.
4. Provide notification appliance circuits for the Automation Wing Second Floor and Attic.
5. Provide a switch module in the FACP with a minimum of 8 programmable switches which will allow an operator to independently silence or activate each of the notification appliance circuits for the Automation Wing Second Floor and Attic.
6. Provide addressable duct smoke detectors or non-addressable duct smoke detectors with addressable interface devices which monitor alarm and trouble output contacts, located in the supply air ducts of AHU-12 and AHU-13.
7. FACP shall monitor the Viking Firecycle system control panels for the Automation Wing Second Floor (Zone 8) and Attic (Zone 9) through addressable interface devices. The fire alarm contractor shall coordinate with the fire sprinkler contractor for the actual locations of the new Viking Firecycle control panels. The FACP shall monitor the following signals from each new Viking Firecycle system (Zones 8 and 9):
  - 1) System Trouble
  - 2) Zone Relay Module Supervisory
  - 3) Zone Relay Module Alarm
  - 4) System Isolation Valve (directly from tamper switch to the FACP)
  - 5) System Test Isolation Valve (directly from tamper switch to the FACP)
  - 6) System Flow Pressure Switch (directly from pressure switch to the FACP)
8. The FACP shall provide zoned fire alarm signals to the facility's Direct Digital Control System (DDCS) through addressable control modules to a direct digital control panel (DDCP). The signals shall indicate that a fire has been detected in the Automation Wing Second Floor (Zone 8) or in the Attic (Zone 9). The existing DDCP is by Johnson Controls. System design, configuration, programming and testing must be supervised by a National Institute for Certification in Engineering Technologies (NICET) level III (or IV) Fire Alarm Engineering, familiar with the system being installed.
9. Provide, configure and activate the alarm verification feature for both new and existing analog smoke detectors connected to the FACP.
10. The FACP shall control the door hold/release devices for the corridor doors on the Automation Wing Second Floor through an addressable control module.

#### **1.5 CONFLICTING REQUIREMENTS**

- A. In the case of a conflict within this specification, applicable codes, accompanying drawings, and other supplemental specifications, the Contractor shall submit the matter in writing to the Contracting

Officer (COR) who will provide written clarification. Alert the COR to any discrepancies found. NFPA Appendices shall be considered mandatory for the purposes of this specification.

**1.6 SYSTEM DESCRIPTION**

- A. General: Provide a system with addressable detectors, addressable manual pull stations, addressable interface devices, and addressable control devices for the Automation Wing Second Floor and Attic. Activate alarms by manual pull stations, space smoke detectors, sprinkler system activation or duct smoke detectors.
- B. Major components: Provide the following fire detection and alarm signaling system components:
  - 1. Manual pull stations
  - 2. Audible and visual alarm appliances
  - 3. Smoke detectors
  - 4. Addressable interface devices
  - 5. Addressable control devices
  - 6. Interconnecting wiring
  - 7. Conduit
  - 8. Accessories
- C. Circuit supervision: Provide Class A (style 6 or 7) wiring for signaling line circuits, Class A (style D or E) initiating device circuits, and Class A (style Z) wiring for notification appliance circuits per NFPA 72. Provide separate notification appliance circuits for the Automation Wing Second Floor and Attic.
- D. System alarm detection: When a confirmed fire condition is detected by one or more fire alarm initiating devices, the following shall occur immediately:
  - 1. System alarm LED lights shall be on the existing FACP.
  - 2. Sounding of the local alarm sounding device shall be in the existing FACP.
  - 3. Indication of zone, floor, and type of initiating device shall appear on the existing LCD Display.
  - 4. Activation of the audible and visual alarm appliances are in the facility for general evacuation.
  - 5. Activation of the door hold/release devices to close the doors at each end of the corridor on the second floor.
  - 6. Send signal to the DDCS and FEPC to indicate a fire alarm in the Automation Wing and to activate the general alarm output of the FEPC. The DDCS shall stop AHU-12 and AHU-13, Exhaust fans EF-1A, 1B, 2, 5, 6, and 7, and close the associated dampers. Coordinate with Section 15975.
  - 7. An appropriate status change message is sent to the existing printer with the date and time of occurrence.
- E. System Trouble detection: When a trouble condition is indicated by a malfunction of an initiating device circuit, signaling line circuit, or notification appliance circuit, or an analog smoke detector goes into pre-alarm, the following functions shall occur immediately:
  - 1. System trouble LED lights on the existing FACP.
  - 2. Sounding of the local trouble sounding device in the existing FACP.
  - 3. Indication of system trouble on the existing GAP.
  - 4. Trouble signal sent to the DDCS and FEPC.

5. An appropriate status change message is sent to the existing printer with the date and time of occurrence.
  6. FACP shall indicate the pertinent information associated with the alarm on the LCD.
- F. Supervisory Signals: When an off normal condition is indicated by a tamper switch, sprinkler panel trouble or power failure indication, duct smoke detector trouble signal, analog addressable smoke detector alarm verification pre-alarm signal, or other off normal condition, the following functions shall occur immediately:
1. System supervisory LED lights on the FACP.
  2. Sounding of the local supervisory sounding device in the FACP.
  3. An appropriate status change message is sent to the existing printer with the date and time of occurrence.
  4. FACP shall indicate the pertinent information associated with the alarm on the LCD.

#### **1.7 SUBMITTALS**

- A. Product Data: Submit product data for each type of system component specified including dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and Nationally Recognized Testing Laboratory (NRTL)-listing data. Product data shall also include, but not be limited to, manufacturer's catalog cuts, technical data, and warranty data for each component or device used in the system. Manufacturer's literature and technical data shall indicate the type, size, rating, style, catalog number, product names, photos, and catalog data for the following:
1. Smoke detectors
  2. Manual pull stations
  3. Addressable interface devices
  4. Addressable control devices
  5. Audible and visual alarm notification appliances
  6. System components to be placed within existing FACP
  7. Conduit, wire and cable
  8. Signs and labels
  9. List of recommended spare parts, supply source, and cost for components of the system
- B. Calculations: Provide calculations required to verify compliance with NFPA 72 and this Specification Section:
1. Battery and battery charger calculations
  2. Notification appliance circuit power calculations
  3. Cable sizing calculations
  4. Detector spacing calculations
- C. Shop drawings: Drawings shall be signed and sealed by a licensed Professional Fire Protection Engineer. Drawings shall indicate locations, installation details and sequence of operation of devices and equipment associated with the system. Floor plans showing equipment locations, conduit runs, and sizes of wire and other details shall be provided. Ceiling detectors shall be shown on reflected ceiling plans which show the locations of light fixtures, diffusers, registers, grilles and other equipment which affect the smoke detector layout. Wiring diagrams shall include diagrams for equipment and for the system with terminals and interconnections identified. Make diagrams specific to this Project and distinguish between field and factory wiring. Clearly identify interface

requirements between fire alarm system and Section 15975 "Control Systems - Electronic and Direct Digital Controls," including software addresses, device labels, and device locations. Clearly identify interface requirements between fire alarm system and Section 15325 "Automatic On/Off Sprinkler System."

- D. Installer qualifications: Submit resume listing installer's qualifications including manufacturer's certification as an approved system installer and a list of recently completed projects demonstrating 5 years of system installation experience.
- E. Start-up personnel qualifications: Submit resume listing start-up personnel qualifications including manufacturer's certification as an approved system technician and a list of recently completed projects demonstrating 5 years of system start-up experience.
- F. As-built drawings: Upon completion of system submit as-built drawings showing actual installation conditions. Show locations and identification addresses of manual stations, detectors, addressable interface devices, addressable control devices, and tamper switches. Also show location of audible and visual notification appliances, conduit routing details, including conduit to existing FACP and conduit for interface to the DDCS.
- G. Test plan: A test plan which describes the methods to be used for system testing shall be submitted at least 60 days before the scheduled test date. Include a step by step description of the tests, and indicate type and location of test apparatus to be employed. Demonstrate that the operation and installation requirements specified have been met. Test devices and appliances serving the Control Wing basement according to NFPA 72 requirements. Additionally, there are existing initiating devices and notification appliances connected to the FACP's which serve other areas of the facility. Test at least 10% of existing initiating devices and all existing notification appliances, including any remaining Pyrotronics initiating devices and notification appliances, in accordance with NFPA 72 testing requirements. After testing, a report of test results shall be submitted.
- H. Operation and maintenance manuals: Complete operation and maintenance instruction manuals shall be submitted. The manuals shall detail aspects of system operation and maintenance, including electrical schematics, a written description of the system design, drawing illustrating control logic and equipment location, and technical bulletins describing each item of equipment used in the system. Include check lists and procedures for emergency situations and trouble shooting techniques. Include a list of required tools and equipment for site personnel to maintain system including detector testers etc. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.
- I. System operation description: Submit a system operation description covering this specific Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are unacceptable. Provide a copy of system operation description in a plastic sleeve, at the FACP.
- J. Record of field tests of system: Submit a record of field tests for devices tested. Record shall include device location, type, address, and other relevant data as well as date of test and signature of start-up personnel performing tests.
- K. Inspection documents are specified in Part 3 of this Section.

#### 1.8 QUALITY ASSURANCE

- A. **Installer Qualifications:** Engage a factory-authorized Installer to perform work of this Section. Installer shall have a minimum of 5 years experience in design, installation, and testing of fire detection and alarm systems. Submit a list of systems of similar nature and scope, successfully completed within the last two years and provide proof of available telephone communications on a 24 hour, seven day a week basis. Be able to provide replacement parts on an emergency basis, and have experienced service personnel available for emergency service. System design, configuration, installation, programming and testing shall be supervised by a National Institute for Certification in Engineering Technologies (NICET) level III (or IV) Fire Alarm Engineering Technician, familiar with the system being installed.
- B. **Single-Source Responsibility:** Obtain fire alarm components from a single source who assumes responsibility for compatibility of system components.
- C. **Comply with NFPA 70 and 72.**
- D. **Listing and Labeling:** Provide fire alarm systems and components specified in this Section that are listed and labeled and maintain the overall listing for the entire fire detection and alarm system.
  - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Store equipment and materials inside and protected from weather.

**1.10 SEQUENCING AND SCHEDULING**

- A. **Existing Fire Alarm Equipment:** Maintain fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until new equipment is accepted. Remove tags from new equipment when put into service and tag existing fire alarm equipment "NOT IN SERVICE" until removed from the building.
- B. **Equipment Removal:** After acceptance of the new fire alarm system, remove existing disconnected fire alarm equipment, wiring, and exposed conduit. Remove from site and legally dispose of material. Ensure that existing fire alarm equipment serving other areas of the facility remains in service at all times.

**1.11 EXTRA MATERIALS**

- A. **Furnish extra materials** described below; that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents. Furnish a quantity equal to the percentage (rounded up to the next whole number) of the number of units installed under this contract in the Automation Wing Second Floor and Attic as listed below, but not less than one. Turn over extra materials to the COR prior to the start of the final acceptance testing.
  - 1. Strobe lights and combination strobe horns: 10 percent
  - 2. Smoke detectors of each type: 10 percent
  - 3. Duct smoke detectors: 2 percent



4. Detector bases: 2 percent
  5. Horns, manual pull stations: 2 percent
  6. Interface devices, control devices: 2 percent
- B. Special tools and equipment: Furnish special tools and equipment required to maintain the system as follows:
1. Detector tester;
  2. Detector removal device with extension pole; and
  3. Manual pull station reset key (provide quantity of five).

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Provide new system components designed and fabricated by one manufacturer with the following characteristics:
1. Equipment and materials: Design and fabricate in accordance with NFPA 13, 70, 72, 90A, and 101.
  2. Provide standard products of the manufacturer's latest design that are suitable to perform the functions intended. The name of the manufacturer and the serial number shall appear on major components. Equipment, material, devices, and accessories shall be NRTL listed and labeled for their intended use.
  3. Manufacturers of NRTL listed or approved addressable fire detection systems shall have an established record of working installations and shall be capable of providing documentation showing experience with addressable systems.
  4. To be compatible with existing site FACP, maintaining NRTL listing or approval (such as UL 864) of the overall system.

### **2.2 MANUFACTURERS**

- A. Acceptable manufacturers: Manufacturers of equipment compatible with the existing Siemens Cerberus MXL addressable Fire Alarm Control System (FACS). Initiation devices, control devices, interface devices, annunciation appliances, and monitor modules provided under this contract shall match existing facility equipment except where existing equipment does not match requirements of this specification.
- B. Fire Alarm Control Panel (FACP): New system devices and appliances shall be wired to the existing site FACP which was previously installed in the Control Wing first floor. Connection to the FACP shall provide the sequence of operation required by this specification. The fire detection and alarm system in the existing building shall remain in service at all times during construction.
- C. Software and firmware: Upgrade software and firmware to latest available versions.
- D. Circuit connections: Circuit conductors entering or leaving the panel shall be connected to screw type terminals with each terminal marked for identification.

### **2.3 ADDRESSABLE DEVICES**



- A. General: Provide new detection and alarm circuit devices, designed to interface with existing FACP for central alarm capability, and suitable for use in a Class A electrically supervised 24 VDC circuit:
- B. Smoke Detectors:
  - 1. General: Comply with UL 268. Include the following features:
    - a. Factory Nameplate: Serial number and type identification.
    - b. Operating Voltage: 24-V dc, nominal.
    - c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
    - d. Plug-in Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection requires no springs for secure mounting and contact maintenance. Terminals in the fixed base accept system wiring.
    - e. Integral Visual Indicating Light: Connect to indicate detector has operated.
    - f. Remote Controllability: Individually monitor detectors at the FACP for calibration, sensitivity, and alarm condition, and individually adjust for sensitivity from the FACP.
    - g. Ambient conditions: Detectors shall be rated for the ambient temperature, humidity, and air velocity conditions in which they are installed.
  - 2. Alarm verification: Provide, configure and activate the alarm verification feature for existing and new analog addressable smoke detectors in accordance with NFPA 72 requirements for alarm verification. The FACP shall generate a pre-alarm supervisory signal whenever a detector activates/enters the 45 second alarm verification time period. The alarm verification feature shall reduce the possibility of unwanted alarm signals through one of the following methods:
    - a. A detector must report an alarm condition for 45 continuous seconds before the alarm condition is accepted as valid by the fire alarm control panel.
    - b. When a detector reports an alarm condition, the fire alarm control panel shall reset the detector. After reset, if the detector again reports an alarm condition within 45 seconds, the alarm shall be accepted as valid by the fire alarm control panel.
  - 3. Photoelectric Smoke Detectors: Include the following features:
    - a. Sensor: Operates on the light scattering principle, with minimum air velocity rating of 3000 FPM.
    - b. Detector Sensitivity: Between 2.5 and 3.5-percent-per-foot (0.008- and 0.011-percent-per-mm) smoke obstruction when tested according to UL 268.
  - 4. Ionization-Type Smoke Detector: Multiple-chamber type operating on the ionization principle and actuated by the presence of invisible products of combustion and have a minimum air velocity rating 1500 FPM.
  - 5. Duct Smoke Detector: Ionization type, UL 268A listed.
    - a. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied.
    - b. Relay Fan Shutdown: DPDT relay contacts rated for 5 amps at 120 VAC or 28 VDC minimum, to interrupt fan motor-control circuit.
    - c. The front of the detector shall have visible alarm and status lights, key controlled test and reset switches, and accessible test jack. Where detector is installed more than 10 feet above

the finished floor or in a concealed location, such as above a ceiling, provide remote LED status indicator light located in an accessible location.

- C. Manual pull stations: Red, dual action, addressable type, flush-mounted design with raised lettering in white. Provide to manually activate the fire alarm system. On activation, stations cannot be restored to the normal operating condition without deliberate operator intervention. Mount stations at building egress points, and in compliance with the authority having jurisdiction over the fire alarm system. Manual pull station shall be listed under UL 38.
- D. Addressable interface device: To monitor and supervise a device with a normally open contact, and provide an input signal with a unique address to the existing FACP identifying the status of the device. Distinguish the following input signal conditions: normal (open contact), short circuit (closed contact), and open circuit (field wire break). Provide one addressable interface device for each device to be monitored. Each monitored device shall have a unique address in the FACP software.
- E. Addressable control device: Respond to unique addressed command from existing FACP and operate SPDT output contacts. Contacts rating: 2 A at 28 VDC, 300 mA at 120 VAC. Integral red LED to indicate normal operation and contact activation.
- F. Line Fault Isolator: Provide as required to comply with requirements of this Section. Isolator shall cut power to devices beyond the isolator when a fault occurs. Isolator shall continuously check the faulted side of the loop and automatically reset itself when the fault is corrected. Where multiple isolators are activated due to a fault, all isolators on the loop shall automatically reset except for the isolator closest to the fault.
- G. Tamper Switches: Provided under Section 15325. Monitor each tamper switch with an addressable interface device and provide each tamper switch with a unique FACP software address.
- H. Sprinkler System Monitoring: Monitor the sprinkler control panels for the Automation Wing Second Floor and Attic provided under section 15325 with addressable interface devices wired to the FACP. The points to be monitored on each panel are: Fire, Trouble, and Power. Each monitoring point shall be provided with an individual software address within the FACP.

## **2.4 ALARM NOTIFICATION APPLIANCES**

- A. General: Provide notification appliances to annunciate alarm conditions in compliance with ADA Accessibility Guidelines for Buildings and Facilities and NFPA 72 requirements. The design shown on the drawings shows the minimum acceptable candela rating for the strobes. Where more than 2 strobe lights are located within the concentrated view-path of an occupant, the strobe lights shall be synchronized to comply with ADA recommendations concerning photosensitive epilepsy. The horns utilizing code 3 alarm signaling on each circuit shall be synchronized on each circuit.
  - 1. Horns: Synchronized temporal pattern (code 3) horn with polarized, electrically supervised 24 VDC circuit. At minimum rated voltage: Minimum average output of 80 dbA at 10 feet as measured in a reverberant test room per UL 464, or 90 dbA at 10 feet, as measured in an anechoic test room. Finish: red baked on enamel. Horns shall be listed under UL 464.
  - 2. Strobe lights: Clear translucent lens with FIRE imprinted in red. Effective light output shall be a minimum of 15, 30, 60, or 95 candela, as required for the location. Match light output to area served according to NFPA 72: Chapter 6. Strobes shall be listed under UL 1971.
  - 3. Strobe horns: Combination strobe light and horn. Finish: Baked-on red enamel, clear translucent lens with FIRE imprinted in red. Effective light output shall be a minimum of 15, 30, 60, or 95

candela, as required for the location. Match light output to area served according to NFPA 72: Chapter 6. Synchronized temporal pattern (code 3) horn is with polarized, electrically supervised 24 VDC circuit. At minimum rated voltage: Minimum average output of 80 dbA at 10 feet as measured in a reverberant test room per UL 464, or 90 dbA at 10 feet, as measured in an anechoic test room. Strobe horns shall be listed under UL 464 and UL 1971.

4. Horns shall be spaced to ensure that an alarm sound level of at least 15 dBA above the average ambient sound level or 5 dBA above the maximum sound level which has a duration greater than 60 seconds. Typical ambient noise levels shall be in accordance with NFPA 72, Section A-6-3.2:
  - a. Business spaces 55 dBA (ambient)
  - b. Mechanical spaces 85 dBA (ambient)
  - c. Storage spaces 30 dBA (ambient)

## **2.5 DOOR HOLD/RELEASE DEVICES**

- A. Door hold/release devices are specified in Section 08710 "Door Hardware". Provide the necessary wiring and connections to activate the door hold/release devices to close the doors on system alarm detection.

## **2.6 INTERFACE WITH DDCS**

- A. Refer to Section 15975 for operational information and details on the air handling and duct mounted smoke detectors. Provide zone fire alarm outputs to DDCS for alarm indication and annunciation, through the existing TIA-422 interface or through addressable control modules. See Graphic Annunciator Panel Detail for zone layout.

## **2.7 FIRE ALARM CONTROL PANEL**

- A. FACP Components: Provide as needed to meet requirements of this specification. Maintain UL 864 listing of entire FACP.
3. Power supply: Provide additional power supply assembly capable of converting 120 volt AC input through a transformer and rectifier to low voltage DC output to supply the power requirements of the new system components if the existing power supplies do not have adequate capacity. Power supply shall be capable of automatically transferring from normal to emergency power and from emergency to normal power without causing a false alarm. Equipment connected to AC circuits shall be protected from power line surges. Fuses shall not be used for surge protection. Power supply shall be listed under UL 1481.
  - a. Emergency power: Provide additional storage battery capacity which, together with the existing battery capacity, is capable of supplying emergency power to the fire alarm system for 24 hours. At the end of the standby period the batteries shall have enough power to sound the alarm indicating devices for five minutes. New batteries are not required if the existing battery capacity is capable of meeting the specified requirements for the whole system including the components added in this contract.
  - b. Storage batteries: Provide rechargeable, sealed, batteries with ampere hour rating sufficient to meet emergency power requirements. Provide reliable separation to prevent contact of terminals with terminals of adjacent cells and between terminals and other metal parts. Dry cells are not acceptable.

- c. Battery charger: Provide additional battery charger capacity as required to match additional battery capacity. Provide charger with automatic high-low charging rate. Total system charger capacity shall be capable of recharging the batteries from full discharge in a maximum of 48 hours.
- 4. Interface boards: Provide additional interface boards, chassis, power supplies and appurtenances necessary to meet requirements of this specification and to provide a fully functional fire alarm system.
  - a. Analog sensor module: Shall provide the communication link between addressable devices and the central control unit. Each analog sensor module shall be capable of communicating with a maximum of 120 addressable devices. The addressable devices shall be analog smoke sensors, heat sensors, addressable interface devices and addressable control devices.
  - b. Control modules: Notification appliance output circuits shall be equipped with individual zone alarm silence switches. Each output circuit shall be capable of being programmed through the configuration software, to allow alarm annunciation in single zone, multi-zones or all zone modes. Alarm silence switches shall allow alarms to be silenced in single zone, multi-zones or all zone modes. Configure circuits to control 19-24 volts DC audible or visual appliances. Each output circuit shall be configured for code 3 outputs. When all alarms have been acknowledged and cleared, the FACP trouble signal shall sound until every zone silence switch and the general alarm silence switch is in the active position.
- 5. Switch module: Provide a switch module in the FACP with a minimum of 8 programmable fire alarm system control switches, which will allow an operator to activate fire alarm control functions such as zone evacuation, zone silence, total evacuation, etc. When a switch is operated, pertinent information associated with switch operation shall be indicated on the LCD display in the FACP and stored in the system event history memory. Also an appropriate status change message shall be sent to the printer with the date and time of occurrence. Provide the programming for the switches which will operate the notification appliance circuits provided under this project, as well as any existing notification circuits provided under previous projects.
  - a. Under this project the notification circuits to be programmed to serve the system in the Automation Wing Second Floor and the Automation Wing Attic.
  - b. Existing notification circuits to be programmed serve the Power System Building, the Control Wing DSR Area, and the Automation Wing First Floor and Basement.
  - c. The remaining control switches are to be reserved for control of future notification circuits.

## **2.8 CABLE AND WIRING**

- A. Cable shall comply with Section 16120 Wires and Cables” except as listed below. Provide power limited 300V, 105 degree C cable of the type indicated for the use below. Bell wire, intercom, or telephone wire is not acceptable. Comply with NEC Article 760 requirements and manufacturer’s recommendations.
- B. For initiating device circuits, provide type FPL cable with red PVC jacket and 18 to 12 AWG twisted conductors. Twisted pair cables shall be Belden 9571, 9572, 9580, and 9582.
- C. For notification appliance circuits, provide type FPL cable with red PVC jacket and 16 to 12 AWG twisted conductors. Twisted pair cables shall be Belden 9572, 9580, and 9582.

- D. For signaling line circuits, provide type FPL cable with red PVC jacket, aluminum-polyester shield and 18 to 12 AWG twisted conductors. Twisted pair cables shall be Belden 9574, 9575, 9581 and 9583. Where unshielded cable is specifically required by the fire alarm system manufacturer, provide cable as specified for initiating device circuits.
- E. Power wiring shall be 12 AWG, Type THHN/THWN, solid wire in separate raceway.

## **2.9 FUNCTIONAL DESCRIPTION OF SYSTEM**

- A. Software: Upgrade the existing software as required to maintain operation of the existing system as well as to operate the Automation Wing Second Floor and Attic system components provided under this contract. The revised system software shall include the following:
  - 1. The system configuration shall be loaded through the use of communication software after accessing the system. Once the system configuration is loaded, it shall be compared with a set of checks and balances assuring proper input. Reconfiguration shall be accomplished by updating the existing software files to accommodate the new or changed requirements. Once loaded, the configuration shall be stored in a nonvolatile memory and maintained even if total power is lost. The execution of the system configuration shall take place through a nonvolatile ROM memory, which shall maintain system configuration data even if total power is lost. Systems that require batteries or battery back-up for the programming function are unacceptable.
  - 2. Field programming: Provide a system that is field programmable, and configurable, through the use of manufacturer supplied software. Field programming shall allow expansion, changing devices, and custom location messages.
- B. Include the following system functions and operating features:
  - 1. Priority of Signals: Accomplish automatic response functions by the first zone initiated. Alarm functions resulting from initiation by the first zone are not altered by subsequent alarms. The highest priority is an alarm signal. Supervisory and trouble signals have second- and third-level priority respectively. Higher-priority signals take precedence over signals of lower priority, even though the lower-priority condition occurred first. Annunciate alarm signals regardless of priority or order received.
  - 2. Non-interfering: Zone wiring shall be configured for non-interfering operation. A signal on one zone shall not prevent the receipt of signals from any other zone. Zones shall be manually resettable from the FACP after the initiating device or devices are restored to normal.
  - 3. Silencing at the FACP: Switches provide capability for acknowledgment of alarm, supervisory, trouble, and other specified signals at the FACP, and capability to silence the local audible signal and light a light-emitting diode (LED). Subsequent zone alarms cause the audible signal to sound again until silenced by switch operation. Restoring alarm, supervisory, and trouble conditions to normal extinguishes the associated LED and causes the audible signal to sound again until restoration is acknowledged by switch operation.
  - 4. Loss of primary power sounds a trouble signal at the FACP. The FACP indicates when the fire alarm system is operating on an alternate power supply.
  - 5. FACP Alphanumeric Display: Displays plain-English-language descriptions and addresses of initiating devices, alarms, trouble signals, supervisory signals, monitoring actions, system and component status, and system commands.
  - 6. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP allows the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. The same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors.

Sensitivity adjustments and sensitivity adjustment schedule changes are recorded by the system printer.

- C. Recording of Events: Print a record of alarm, supervisory, and trouble events on the system printer. Printouts are by zone, device, and function. When the FACP receives a signal, the alarm, supervisory, and trouble conditions are printed. The printout includes the type of signal (alarm, supervisory, or trouble), the zone identification, date, and the time of the occurrence. The printout differentiates alarm signals from other printed indications. When the system is reset, this event is also printed, including the same information for device, location, date, and time. A command initiates the printout of a list of existing alarm, supervisory, and trouble conditions in the system.
  - 1. Permissible Signal Time Elapse: The maximum permissible elapsed time between the actuation of any fire alarm or fire-detection system alarm-initiating device and its indication at the FACP is 2 seconds.
  - 2. Independent System Monitoring: Supervise each duct detector, and Automatic On/Off Sprinkler system for both normal operation and trouble.
  - 3. Circuit Supervision: Indicate circuit faults by both a zone and a trouble signal at the FACP. Provide a distinctive indicating audible tone and LED-indicating light. The maximum permissible elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.
- D. Horn/Strobe Alarm Annunciation:
  - 1. Sequence of operation: When a fire alarm condition occurs, the alarm annunciation system shall activate horns and strobe lights in the entire facility. The alarms shall remain active until the alarm is acknowledged and the alarm silenced at the fire alarm panel.
  - 2. Alarm signal zoning: Alarm appliances shall be zoned separately for each wing of the facility (Automation Wing, Control Wing, Administration Wing, and Power Service Building). The zoning is required to provide selective evacuation capability which may be activated in the future. Provide separate zones for the Automation Wing Second Floor and Attic with individual alarm silence switches. The system shall allow authorized users to silence or activate the alarm horns and strobes on an "all call" or zone-by-zone basis. When all alarms have been acknowledged and cleared, the FACP trouble signal shall sound until every zone annunciation appliance silence switch is in the active position.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Install system according to NFPA standards referenced in Parts 1 and 2 of this Section and Manufacturer's recommendations. Except where noted otherwise, comply with Section 16050, Section 16100, Section 16120, and Section 16195.
- B. Design fastening and supports to support loads with a safety factor of five. Fasten equipment firmly in place.

### **3.2 EQUIPMENT INSTALLATION**

- A. Manual Pull Stations: Mount semi-flush in recessed back boxes with operating handles 48 inches above the finished floor or lower as indicated.



B. Valve Tamper Switches: Connect addressable interface device to tamper switch for each sprinkler valve station required to be supervised. Provide each switch with unique software address in FACP.

C. Smoke Detectors:

1. Detectors require a four inch by four inch device box with a 3/0 ring; Locate on the highest part of a smooth ceiling so that the edge of the detector is not closer than three feet from a sidewall. Install in accordance with the manufacturers instructions. Ceilings with heights greater than 10 feet above the floor, or ceilings with beams, joists, soffits or other objects that exceed eight inches in depth require closer spacing than normally recommended by the manufacturer. Comply with NFPA 72 requirements.
2. The location and spacing of smoke detectors shall take into consideration the velocity and direction of air flow, ceiling construction, beam and truss locations, ceiling obstructions, the presence of areas with stagnant air, and the location of equipment in the area. Detectors located in areas with high air movement require closer spacing than normally recommended by the manufacturer. Comply with NFPA 72 requirements.
3. If it is necessary to mount a detector upon a sidewall, locate the top of the detector no closer than 4 inches from the ceiling and no further away than 12 inches.
4. Install smoke detectors to favor the air flow toward return openings; do not locate where detectors within 60 inches of air supply diffusers, or where detector performance is adversely affected. Detectors mounted on a suspended ceiling shall be mounted near the center of the ceiling tile.

D. Duct smoke detectors: Surface mount housing on the side of the composite supply air duct. Install remote LED status indicators where the duct smoke detectors are installed more than 10 feet above the finished floor or in concealed locations where the detector's alarm indicator is not readily visible.

E. Audible Alarm-Indicating Devices: Install not less than 90 inches above the finished floor nor less than 6 inches below the ceiling. Install horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille or as indicated. Combine audible and visual alarms at the same location into a single unit. Combined audible and visual units shall be installed as described below.

F. Visual Alarm-Indicating Devices: Install adjacent to each alarm horn, not less than 80 inches above the finished floor and no greater than 96 inches above the finished floor.

G. Combined Audible and Visual Alarm-Indicating Devices: Install not less than 80 inches above the finished floor and no greater than 96 inches above the finished floor.

### **3.3 WIRING INSTALLATION**

A. Wiring Method: Conceal raceway except in unfinished spaces and as indicated. Do not splice wire except where required to connect to a device. Where lengths of wire must be joined together to complete a long run, join them at a terminal strip mounted in a hinged or screw cover junction box. Do not transpose or change colors.

1. Install cable and wire in appropriately sized raceway, but not less than 3/4 inch diameter.
2. Install cable of the type indicated for the use, and install in accordance with NEC Article 760.
3. Leave eight inch wire tails at each device box. Leave 120 inch wire tails at the FACP to allow future relocation of the FACP.

4. Loop the cable for initiating device circuits from the addressable interface device to the initiating device, then back to addressable interface device.
  5. Loop the cable for notification appliance circuits, audible or visual, from the control module to the first notification appliance, on to each successive appliance, and then back to the FACP.
  6. Loop the cable for signaling line circuits from the FACP to the first addressable initiating device, then on to each successive addressable device, and then back to the FACP. Maintain shield continuity and connect to earth ground only at the FACP. Do not route intelligent detector wiring adjacent to, or in the same conduit with audio-visual power wiring, 120/240 VAC power wiring or other high current circuits.
  7. Provide a minimum of two inches of separation between cable and open conductors, light, power, or class one circuit. Do not place cable in outlet boxes or raceways containing non fire alarm conductors.
- B. Wiring within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Cable Connections: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- D. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Paint fire alarm system junction boxes and covers red.
- E. Risers: Install at least 2 separate vertical cable risers between the fire alarm devices and the FACP. Risers in close proximity to each other shall be separated with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.

### 3.4 IDENTIFICATION

- A. Identify system components, raceway, wiring, cabling, and terminals according to Section 16195.
- B. Signs and labels: Permanent nameplates shall be used in the FACP to identify control logic units, contacts and major circuits. Lettering except for within FACP shall be bold-face of minimum 1 inch in height and shall be of the engraved type. Provide a contrasting red background with white lettering.

### 3.5 GROUNDING

- A. Ground cable shields and equipment are according to system manufacturer's instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.

### 3.6 FIELD QUALITY CONTROL

- A. General: Demonstrate that the entire Fire Alarm and Control system functions as designed and specified. Test circuits under automatic alarm conditions, manual alarm conditions, and equipment shutdown in accordance with NFPA 72: Chapter 7. There are approximately 300 existing alarm initiating devices and approximately 35 notification appliances in other areas of the facility. Test at least 10 percent of the existing initiating devices and all notification appliances in accordance with



NFPA 72: Chapter 7. In addition, test the complete system for power failure conditions. Tests shall be witnessed by the COR.

- B. Manufacturer's Field Service: Provide services of factory-authorized start-up personnel to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- C. Pretesting: After the installation is complete, have factory trained personnel inspect the system in accordance with the manufacturers recommended procedures, include testing the wiring for proper connection, continuity and resistance to ground. After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
- D. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.
- E. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
- F. Operations test: Test the complete system. Functions including system and equipment interlocks shall be operational at least 10 days prior to the final acceptance test. Test each detector and properly set sensitivity in accordance with the manufacturer's recommended procedures. Verify the system and equipment interlocks, i.e., audible and visual alarms and equipment shutdowns, function at test time. Test each circuit for trouble by inducing a trouble condition to the system.
- G. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72. Minimum required tests are as follows:
  - 1. Verify the absence of unwanted voltages between circuit conductors and ground.
  - 2. Test conductors for short circuits using an insulation-testing device.
  - 3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
  - 4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
  - 5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of the initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
  - 6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
  - 7. Test the system for specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.
  - 8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

- H. Existing Pyrotronics high voltage fire alarm system: After demolition of the Automation Wing Second Floor and Attic smoke detectors, manual pull stations, and alarm bells, locate and test remaining smoke detectors, manual pull stations and alarm bells on each floor of the rest of the facility which are to remain in service. Verify that all components operate.
- I. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- J. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.
- K. Tag equipment, stations, and other components at which tests have been satisfactorily completed.

### **3.7 CLEANING AND ADJUSTING**

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

### **3.8 TRAINING**

- A. Engage factory-authorized instructors to demonstrate and train Owner's maintenance personnel as specified below. Equipment installers are not acceptable instructors.
  - 1. Train Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, emergency procedures, safety requirements, system control panel operation, troubleshooting, servicing, adjusting, and preventive maintenance.
  - 2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid. Provide each student with a copy of the operation and maintenance manual.
  - 3. Schedule training is with COR at least 14 calendar days' advance notice. Provide three, eight hour training sessions. Each session shall provide identical information and shall include 6 students.

### **3.9 WARRANTY**

- A. Include a service and parts guarantee of the system for a minimum period of one year and provide any services and equipment incidental to the proper performance of the system under warranty at no additional cost to the Government.

### **3.10 INSPECTIONS**

- A. Provide two inspections of each system during the one year warranty period. The first inspection shall be conducted at the end of six months and the second at the end of 11 1/2 months. Proper working order of the system shall be verified during the inspection. A complete checkout of the control and alarm system shall be conducted. Documents certifying satisfactory system condition shall be submitted after each inspection.

END OF SECTION 13850